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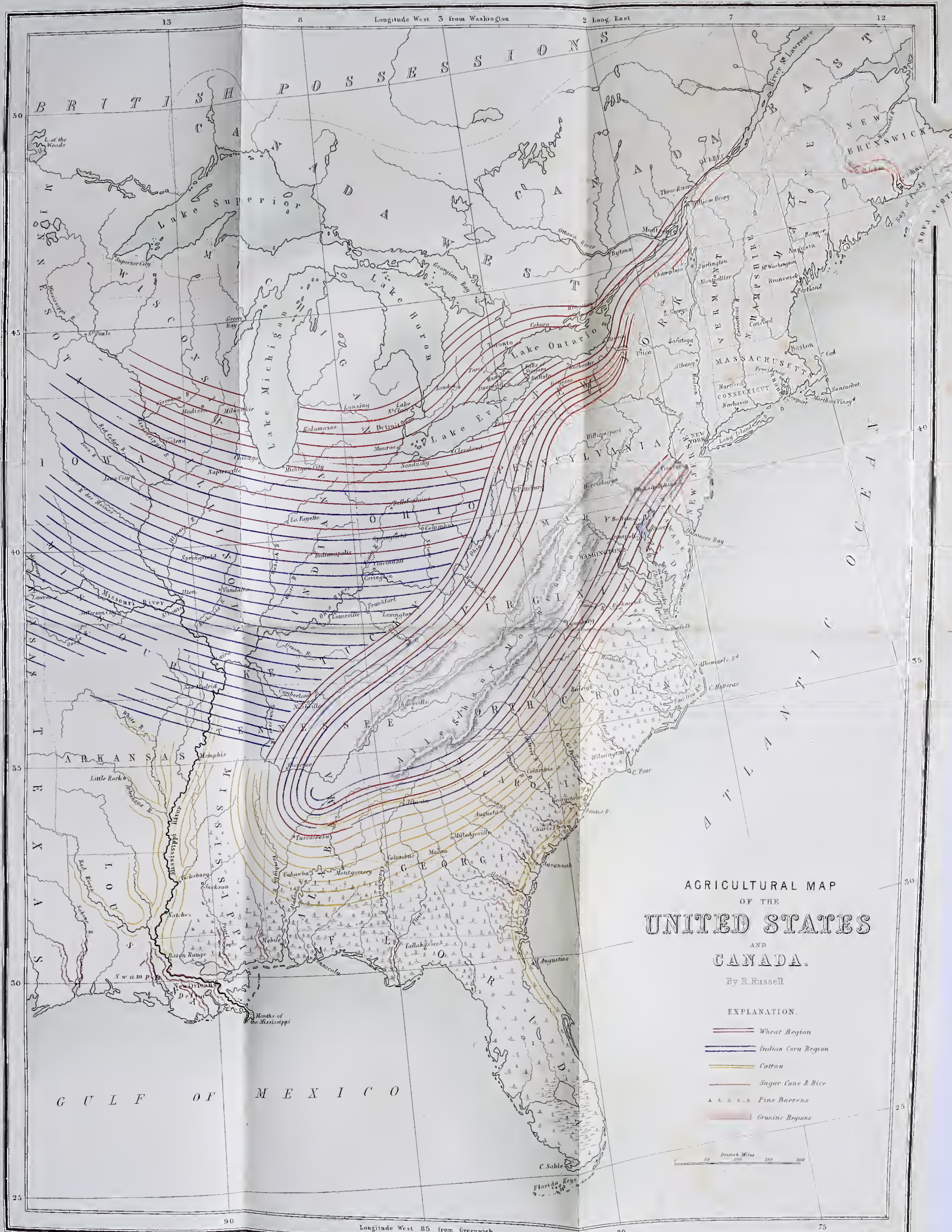
NORTH AMERICA

ITS

AGRICULTURE AND CLIMATE.



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AGRICULTURAL MAP
OF THE
UNITED STATES
AND
CANADA.

By R. Russell

EXPLANATION.

- Wheat Region
- Indian Corn Region
- Cotton
- Sugar Cane & Rice
- Pine Barrens
- Granitic Regions



NORTH AMERICA

ITS

AGRICULTURE AND CLIMATE

CONTAINING

OBSERVATIONS ON THE AGRICULTURE
AND CLIMATE OF CANADA, THE UNITED STATES,
AND THE ISLAND OF CUBA.

BY ROBERT RUSSELL,
KILWHISS.

EDINBURGH:
ADAM AND CHARLES BLACK.

MDCCCLVII

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TO
PROFESSOR JAMES P. ESPY,
WASHINGTON.

MY DEAR SIR,

I take the liberty of dedicating this Volume to you, in grateful remembrance of the kindness I received from you while in Washington. During the many agreeable hours I spent in your company, the climate of North America formed the chief topic of conversation. In the last chapter of this Volume, I now give a fuller exposition of the views sketched out in the Lectures I delivered in the Smithsonian Institution, and which you honoured with your presence. The explanation of the laws which regulate the climate of North America may not meet with your entire approval; but I feel sure that your zeal for the advancement of a science for which you have already done so much, will induce you to give the facts and opinions brought forward your careful consideration.

Believe me,

With feelings of great regard,

Ever faithfully yours,

ROBERT RUSSELL.

KILWHISS, 10th June 1857.

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NORTH AMERICA.

ITS AGRICULTURE AND CLIMATE.

CHAPTER I.

LIVERPOOL TO BURLINGTON, VERMONT.

THE triumphs of steam have, in a great measure, deprived a voyage to America of its former tediousness and irregularity, and given to it much of the character of a ferry passage. This facility put it in my power to gratify a long-cherished wish; and on the 5th August 1854, I sailed from Liverpool on board the “America,” one of the Cunard line of steamers, for Boston, *via* Halifax. In common with the majority of landsmen, I experienced considerable discomfort during the first few days I was upon the restless ocean; but the remainder of the voyage was rendered exceedingly agreeable by intercourse with a varied company of fellow passengers. The weather was more stormy than it usually is at that season of the year; and when we reached the lower latitudes of the American coast, it was much colder than I expected to find it.

On the eleventh day after leaving Liverpool, the coast of Nova Scotia became visible. The heated air from the vast continent cleared the atmosphere of the clouds which had almost constantly obscured it during the voyage; and a glorious afternoon it was when we steered into the magnificent harbour of Halifax. The coast here is barren and rocky, and covered with dwarf spruce trees. There are only small patches fit for cultivation, and the grain crops were quite green.

Another day and two nights' sailing after leaving Halifax brought us at sunrise within sight of the heights of Boston ; and in a short time, after threading her way among islands, ships, and curiously shaped steamers, the " America " reached her landing at East Boston.

I soon found my way to the Revere Hotel, and was greatly surprised at the extent and splendour of its accommodation. The town is built on a peninsula. Its closely packed brick houses, and its streets thickly crowded with omnibuses, reminded me of London. The streets are narrow and irregular, which makes it difficult for a stranger to find his way. On the north side of the town there is a large and fine common, which affords ample space for the recreation of the inhabitants. Three sides of this common are occupied by the dwellings of the most wealthy inhabitants, and in front of the houses rows of American trees, consisting of the sunach, maple, and acacia, beautify this quarter, and afford a grateful shade in the sultry heats of summer.

In no town in America can a stranger spend a few days more agreeably than in Boston. Here there is a numerous class who are not engrossed with the all-absorbing pursuits of commerce. The number of public institutions that are easily accessible impress one favourably with the progress which our western brethren are making in the refinements of modern civilization.

The great increase of Boston, and the limited extent of the peninsula on which it is built, have forced many of the wealthy merchants to reside in the country. For seven or eight miles out of town the country is thickly studded over with handsome villas laid out in ornamental grounds and gardens. Though the land is of the most sterile character, consisting chiefly of sand and gravel, and frequently of bare rocks, with polished surfaces, yet building sites, are worth from £200 to £300 an acre, even at the distance of ten miles from town.

On first landing in America, I was struck with the small stature of the men and women, and also with the paleness of their faces. The great extremes of temperature in the United States seem to deprive the Anglo-Saxon of that

freshness of complexion which is so common in our own cool and equable climate. The day after my arrival I attended a "fair," held on the property of the late Daniel Webster, at Marshfield, in the neighbourhood of Plymouth, the spot where the Puritans first landed. The inhabitants, from a wide circle of country, had assembled to spend a holiday. There was a bazaar for the sale of ladies' work, with a band of music, which formed the chief amusement of the day. The modest mansion where Daniel Webster was wont to reside was thrown open to the public, and was so thronged with visitors that I could hardly elbow my way through it. All were well dressed, and many of the ladies were exceedingly good looking. At Winslow, a short distance from Marshfield, was buried the first white man born in New England. In the same retired spot are mouldering the ashes of Daniel Webster, whose memory is fondly cherished by the people of this district.

The country betwixt Marshfield and Boston, a distance of thirty-six miles, is so miserably poor that little of it is fit for cultivation. From Winslow I walked down to the sea-shore through some fields which had been in pasture for several years. The grass was so completely withered that it crisped beneath my feet, while clouds of grasshoppers rose at every step. Large boulders were thickly imbedded in it everywhere. Yet I was told this was good land, and in good condition. At first I was rather sceptical of my informant being in earnest, but subsequently I discovered that, comparatively speaking, this was not a bad soil for New England, where the granitic rocks predominate. In the salt marshes I saw a farmer loading a waggon with hay, which, though very coarse in quality, cost on the spot £2 : 2s. for a ton of 2000 lbs., and was to be conveyed thirteen miles into the interior.

I paid a visit to B. French, Esq., at Braintree, about six miles from Boston, where also the soil was poor. It is rather wonderful, however, that it is so well adapted for orchards, for the apple trees were bearing abundant crops. Crushed bones are found to be a very beneficial application for fruit trees. The agriculture of this part of America is by no means interesting to one from the old country. The farms are

small, and the offices are usually under one roof. At Braintree they formed a high building of three storeys, with the hay in the upper, the cattle in the middle, and the manure in the under. The foundations were dug out of a sloping bank, and the floor of the upper storey was level with the ground on the outside. There is a great scarcity of straw in the New England states, and the cattle and horses lie on boards for the purpose of economising it.

I spent a day in the manufacturing town of Lowell, which is twenty-six miles from Boston. The intervening country is still more barren, if anything could be so than what I had seen in my trip to Marshfield. The only attempts at cultivation were some crops of Indian corn and market vegetables growing upon sand almost as loose as that upon the sea shore. No rain had fallen for some time, and the air felt most oppressive,—hot as if it had come from an oven, and so opaque with dust that the horizon was black all round, just as it often is before a thunder-storm.

To one newly arrived from the old country, the condition of the Lowell factory operatives is interesting, there being a great contrast in their appearance to that of the same class in our manufacturing towns. The cotton mills at Lowell belong to a corporation or joint-stock company, and furnish employment to about 10,000 hands, of whom 2000 are women earning from three to four dollars a week. These are generally the daughters of the small farmers of New England. After paying their board, they can lay aside about one-half of their earnings, which in three or four years furnish them with a little money, and it is seldom that they remain at the works for a longer period. They board together in private houses, built by the corporation, and let to widows and others. Each boarding-house can accommodate about forty inmates, who are most comfortably lodged. From all that I could learn, the present condition of the Lowell operatives is quite as favourable to a high state of morality as that of the middle classes in Britain. The interest taken in the welfare of the operatives in the New England factories is highly creditable to the spirit of the corporation, and it is

to be hoped that a system productive of such favourable results will not hereafter be broken in upon by the rude necessities of competition.

I was informed by a commercial gentleman that one of the main elements in the success of the factory system, both at Lowell and at Lawrence, arose from the provident wisdom of the corporations buying the land in the neighbourhood of the sites upon which they were to build their works, and afterwards selling it at high rates for building upon. Thus new towns speedily arose to accommodate the population drawn together by the erection of the numerous mills, and imparted a high value to ground that was otherwise comparatively worthless.

The peninsula of Nahant forms a favourite retreat for the Bostonians during the heats of summer. The hotel at Nahant is still more splendid than the Revere at Boston. One night while I was there, Professor Agassiz gave an interesting lecture on the geology of the peninsula to a highly fashionable company in the large dining-room of the hotel. Spending the Sunday at this delightful spot, I attended the only church in the neighbourhood. To suit a class of hearers so miscellaneous as those who frequent the hotel or have villas in the vicinity, ministers of the various Protestant denominations officiate alternately. A committee of laymen make the necessary arrangements for obtaining preachers from the Episcopalian, Baptist, Methodist, Presbyterian, or Unitarian bodies. A preacher of the last-mentioned denomination it fell to my lot to hear. No doctrinal peculiarities could be detected in his sermon, which was practical, and delivered with great earnestness.

It is very difficult to draw lines of distinction between classes of society in New England. At the hotel I had some conversation with a person who had all the appearance and manners of a gentleman, but who was no other than a working mechanic. He had driven down his wife and family from a village thirteen miles inland to have a day's recreation at Nahant. This way of spending a little spare money raises the moral and social condition of those who labour with their hands, and maintains a sense of self-respect. The

general diffusion of education among all classes in New England has had the effect of raising them in a great measure beyond the temptation of indulging in drinking habits, which are more common where ignorance prevails, especially when combined with a high rate of wages. A Sheffield manufacturer, carrying on business both in England and the United States, informed me that in the majority of cases the high wages which he paid to his workmen in Britain did not improve their condition, as so much was squandered for spirits, whereas the educated mechanics of New England were in general a sober and industrious class of men.

After travelling for some time in Massachusetts, one is impressed with the thorough diffusion of education among all classes, and with the universal politeness mingled with independence which prevails. Although American phrases are very common in ordinary conversation, yet in all the larger towns of this State the English language is spoken with great purity. The legislature is making efforts to give a free education to every one who chooses to accept of it. Boston and its environs contain a population of about 300,000, and in 1853 they assessed themselves to the amount of £60,000 for educational purposes.

Leaving Boston, I took the cars to Brunswick in Maine. The country is very poor all the way, and small patches only are in cultivation. Over large portions the granitic rocks protrude, and gravels and sands are the common materials out of which the soils have been formed. Pines, elms, beech, and birch, grow vigorously in this rocky country, and here, as elsewhere in the northern parts of America, it was surprising to see such abundant crops of apples on trees which grow in the roughest gravels.

There is much similarity in the appearance of the New England villages. There are no signs of poverty, and none of great riches. The streets are very wide and unpaved, but broad side-walks made of planks afford good walking in the worst weather. Every house stands detached with a spot of garden ground around it, which gives to the streets a straggling appearance, while the acacia trees planted in front impart a rural aspect in summer. The houses are all made of

boards painted white, and the interiors are kept remarkably clean. The school-house is always the principal building in the village, and neatly-built churches are never wanting.

Under the guidance of Dr. Hitchcock I visited the Congregational college at Brunswick, Maine. This body in America have a system of organisation similar to the Presbyterian; but though they hold stated meetings for the purpose of consultation and of giving advice, no dictation is used towards any individual church. The students lodge in the buildings which are attached to the university. One building accommodates about thirty individuals, who have each a separate room for the half-yearly rent of twenty dollars. This plan of boarding is similar to that which the young women have at Lowell. The system of living in boarding-houses, so common in all parts of the United States, evidently arises from the circumstance, that a better table and better accommodation can by that means be got for less money than by taking up house and keeping servants. Might not this system of association, in an economical point of view, be worthy of a trial in our own manufacturing towns?

The Maine liquor law was still nominally in force while I was in that State, though in many parts it seemed to be in abeyance. I asked the boy at the bar of the hotel in Brunswick if I might have a glass of brandy. "I guess so," was the unhesitating reply. Professor Hitchcock seemed to regard its advantages as problematical. The temperance party were loud in its praise, but there were no data to show that it had much effect either one way or other. At first the law was very rigorously carried out, but afterwards it was much relaxed. In some of the towns through which I passed it was necessary to go to the cellar to obtain liquor, but in others it was sold openly over the bar with as much freedom as if no such law was in existence. This open violation of the law I found in Newbury, Vermont, where I saw people partaking at all hours, and where the good natured landlord was laughing at the legal prohibition. There is, in truth, no executive force here to carry such a law into operation. The temperance party, therefore, had not only to make the law,

but also to become informers in order to have it put into force. It is not to be wondered at that this state of matters did not continue long. The informers soon relaxed in their zeal after having drawn upon their own heads much ill-will, and thus, in many places, the law fell completely into abeyance, which must have a bad moral effect, and tend to weaken the reverence for all laws. But how could any other result be expected, seeing, as my worthy informant assured me, one fourth of the population were opposed to the law and were continually breaking it. It is in the other States, where the temperance party are agitating for the adoption of the liquor law, that its good effects in name are so highly extolled. The New Englanders, on the whole, are a very temperate people. But no doubt the temperate habits of the educated and well-to-do classes, the lawyers, clergymen, and merchants, have a more beneficial influence in promoting and diffusing habits of temperance among those who are beneath them in wealth than the much talked of Maine Law. In New England there is little or no drinking for the sake of sociality as is too much the case in Scotland. Indeed, it is not uncommon to find neither wine nor spirits at dinner parties. Those, on the other hand, who are addicted to drinking in America, drink in earnest, for they begin in the morning taking a little, and continue repeating the dose at intervals throughout the day. It is almost incredible the quantity of spirits which some people consume who have habits of this kind, and who, at the same time, never appear the worse of liquor.

Leaving Brunswick and returning south a few miles, I took my seat in the Atlantic Railway (connecting Portland and Montreal) as far as Gorham Station, which is within eight miles of Mount Washington, the highest mountain in the territories of the United States, east of the Mississippi. The country was only partially cultivated for the first part of my journey. A good many small farms were seen, but the occupants must certainly derive their subsistence from other employments than that of cultivating the land. The soil appeared almost destitute of vegetable mould. There was an exceedingly small portion under cultivation, and the barn which contained all the crop and stock was seldom larger than the

farm house. No fields were seen without numbers of granite boulders sticking out in the withered pastures. The country gradually becomes more rugged and hilly, and much of the level land in the valleys is so thickly covered with boulders as to defy all attempts at cultivation.

The soil and climate of New England, however, are particularly genial to the growth of timber. Fire seems to destroy wide tracts of the forest almost every year during the periods of dry weather; but the burnt surface soon renews its covering. I was shown a spot which had been destroyed by fire the previous year, and which was already occupied with young thriving birch saplings. However rocky and barren the soil may be, if it is not too precipitous, it is always covered by a dense growth of timber; and every little crevice in the rocks affords sufficient hold for some gnarled member of the forest to fix its roots in and obtain a subsistence.

Before reaching Gorham Station, we entered the narrow valley of the Androscoggin. The hills are quite precipitous and thickly timbered. On a few spots of the interval land crops of Indian corn, oats, and potatoes were growing; yellow pumpkins also, many of them a foot and a-half in length, were lying thickly over the ground among the Indian corn, which was parched and withered by the drought. It is rather curious how the broad succulent leaves of the pumpkins obtain sufficient moisture from their long trailing vines, out of a soil consisting of little else than loose sand.

When I arrived at Gorham Station, which is 800 feet above the level of the sea, I found the spacious and elegant hotel newly erected there overcrowded with visitors. Luckily, however, I immediately got a seat in a coach which was just starting for Glen House, a distance of eight miles. Six active little horses were soon dashing along a very rough road recently cut out of the primeval forest. I was struck with the wanton luxuriance of nature, not so much shown in the size of the timber as in the number of trees which the soil was supporting. In the lower valley the forest was almost an impenetrable mass of trunks in all stages of growth and decay, and under their dense shade not a blade of grass was seen.

It appears to be a peculiarity of the primary soils of the New England States that the pine, the elm, the maple, the beech, and the spruce, grow together in social equality. In many places it would have been difficult to find out which of these varieties predominated. In height, however, the pines towered above all the others; and in all those parts of the forest which had been somewhat recently cleared by the fires, the birch was by far the most common. The birch is a rapid grower, but it soon attains maturity or limit of growth, so that, in the long run, it cannot compete with those which ultimately rise to a greater height, and, overtopping it, shut it out from the sun's rays. Thus, in the older portions of the forest, few birch trees are seen. It is the great variety of trees in the New England forests which affords such a gorgeous spectacle when autumn tinges the leaves with so many brilliant hues.

Glen House Hotel, 1600 feet above the level of the sea, is close at the base of Mount Washington, which is 6300 feet. At this hotel, no fewer than 350 persons can be accommodated with board and lodging. The morning after my arrival I started with a party of fifteen ladies and gentlemen to ascend to the top of the mountain. The party were mounted on ponies, and though urged to follow their example, I preferred to walk up at my leisure, and I was afterwards convinced this was the more agreeable mode of ascending.

Mount Washington is densely covered with trees to the height of 4500 feet. The usual varieties prevail at the base, but as you ascend there are fewer, and by and by nothing but pines are seen. These gradually diminish in size till the limit of their growth is attained, where there are some curious specimens of dwarfs less than a foot in height. The stones which afford them shelter from the violent westerly winds regulate their height, as they cannot at a certain elevation rear their heads above the level of their protectors.

In the upper part of the mountain I walked over a considerable space where the forest had been burnt down five years ago. Every trace of vegetable matter had disappeared

from the surface, and the granite stones at a distance looked nearly as white as chalk. There was no appearance of any pines or vegetation coming up to cover what was wasted by the fire. The reclothing of the ground at this great elevation will evidently be a slow process. How different from what takes place below, where the fires seem actually to invigorate the vegetable kingdom.

Like many other high mountains, the summit of Mount Washington is covered with blocks of granite of great dimensions. A roughly built house has been erected on the top calculated to accommodate 100 visitors for a night. On this occasion we met another party which had ascended from the opposite side of the mountain. At dinner we numbered about thirty; some had brought up a good supply of champagne, which was disposed very freely among those who had made no such provision, and altogether our party was a very happy one.

The view from the top was sadly marred by the quantity of smoke which floated in the air, and which was caused by the burning of some parts of the forest. Mount Washington has not the wild sublimity of Ben Nevis and some of the other Scottish hills. It has, however, a grandeur of its own; the high mountains surrounding it on all sides form magnificent ravines all densely covered with timber. As far as the eye could reach, not a spot was in sight under cultivation, a prospect that afforded me some idea of the appearance which the whole country must have presented before the white man set his foot on the western continent.

The blocks on the top of the mountain were covered with a light green lichen. A large lichen (*Parmelia centrifuga*) was seen on some of the stones, many of the specimens being upwards of a foot in diameter. In some respects, the habits of this singular plant resemble those of the fungi, which form the fairy rings in our pastures, growing in a circle, and enlarging every year. In the larger specimens of this lichen, the vitality of the plant was confined to the outer portions, while the inner was decaying and rising from the stone; in many cases, the centre was perfectly bare and destitute of vegetable matter. The larger

lichens seem to live upon the smaller, and probably the larger only have the necessary conditions of growth after the smaller have taken root on the bare surface and arrived at maturity.

This day (the 30th August) was remarkably warm in the valley, but the thermometer was only 60° Fahrenheit on the top of the mountain. The road to the top was simply a rough footpath, but it was amazing how the ponies made their way up, scrambling over stones and roots of trees. It took me about three hours to ascend and one to descend. The ponies were shockingly lean, and no wonder, as it was close upon the end of the season, and some of them had made their fifty-fifth ascent.

Next morning I took the coach to Crawford House, a distance of thirty-five miles; the first eight miles lay over a road made two years ago through the forest. There were mere patches in cultivation, and that only for a small part of the way. The Indian corn was quite parched by the drought; but in the same fields pumpkins were in great quantities. On looking into some of the small farm-houses I was glad to see so many signs of comfort. Before reaching the hotel, I passed through the valley of the Saco. The hills on both sides rose abruptly from the banks of the stream to the height of more than 2000 feet, and were covered to their summits with wood. The accommodation at Crawford House is excellent, though it is situated in the midst of a wilderness.

1st Sept.—Took the coach to St. Johnsbury on the Brunswick River, a branch of the Connecticut, a distance of twenty-two miles. Very little is in cultivation, the sides of the hills being densely and beautifully covered with the original forest, in which the sugar maple is abundant. Passed a few hop gardens. The vines appeared to have fewer leaves and more fruit than those growing in England. Numbers of men and women were busy gathering them. However poor the soil might be, the orchards of apples were bearing fruit in great abundance. Oxen are used here very generally for the plough and the waggon.

I was amused with two passengers on the coach who used the word "guess" in almost every sentence. Both were polite and well dressed. One had been netting pigeons, which are found in great numbers in the woods at this season. The previous day he had taken one hundred and forty at one haul of the net. For these a ready market is got in the towns of the low country at a dollar a dozen. The other had been agent for the stage-coach at Glen House, and as the season for visiting the White Mountains was now nearly over, he was on his way to the low country to find out some other employment for the winter. One grand speculation he had just entered upon; he had bought a large bear for the sum of five dollars. I happened to see the brute the day before; it was black, with the exception of a cream-coloured muzzle, and measured when standing erect, as its exhibitor declared, five feet and a half in height. It had been trapped in the woods, and its former owner had cleared one hundred dollars by exhibiting it during the tourist season. My travelling companion was quite sanguine that he would make a larger sum out of this speculation. He was to take it to the low country and advertise a bear-hunt; every one bringing a dog was to pay him half a dollar. He expected to obtain three hundred subscribers. But in addition, he was at the same time to advertise a horse-race, and offer fifty dollars as a prize, which he was quite sure of winning himself and pocketing the entry-money. There is a strong passion for horse-racing and hunting among the Americans.

The railway from St. Johnsbury runs due south, and we soon got into the valley of the Connecticut, but still there was little land in cultivation. The upland pastures were here, as every where, withered by the drought. Stopped for a night at Newbury, a handsome little town of two thousand inhabitants, where the valley widens out a little, and the wooded hills are considerably lower. I went over a farm which I had heard very much praised. Its owner assured me there was not a better in the valley of Connecticut, or even in New England; and I believe this was not very far from the truth. Yet it was no great affair after

all. It consisted of 700 acres, 500 of which lay back on the hills, and were wholly under pasture; of the 200 acres in the valley some 25 acres were in Indian corn, 35 in oats, and 10 in potatoes, the remainder in pasture and hay. It seems to pay much better to graze the land than to plough much of it. The richest meadows here are overflowed every spring when the snows melt on the White Mountains. These meadows yield about 3 tons of hay, and are worth 100 dollars per acre. When the original turf is broken up, it is long until the grass becomes so good as it was originally. According to the season, from 50 to 95 bushels of Indian corn per acre are got from the best lands, while the ordinary sandy or gravelly land in this valley does not produce more than from 30 to 40. This crop is cultivated in ridges 3 feet wide; some 4 to 5 grains of corn are planted on the ridges at a distance of 2 feet. Towards the latter end of its growth it is slightly earthed up. The proprietor conducted me through the farm-offices, which consisted of a huge building 250 feet by 45, another 250 feet by 20, and two 70 feet by 20. There were stalls for feeding 70 cattle, and 150 could be wintered in the yards. The cattle get an allowance of Indian corn meal when feeding on hay. It is considered good payment if they yield 10s. a month for their keep.

South from Newbury the hills again come closer together, and there is consequently less land in cultivation. In the cars I met a farmer who told me that he possessed 200 acres, but he only had in cultivation 4 acres Indian corn, 7 acres oats, and 4 acres potatoes; he kept 7 or 8 cattle, and 74 sheep during the winter. The majority of farms in New England have not, perhaps, a much larger proportion of land in crop, for the soil is the poorest I could imagine capable of being cultivated. It is nonsense to talk of the land being exhausted, for evidently there never was anything to exhaust. Gravels and sands full of huge boulders are the characteristics of what goes under the name of "improved lands" in the schedule of the census commissioners. In my travels through New England I saw hundreds of acres in cultivation, and Mr. Horace Greeley assured

me he knew of thousands over which one might almost step from one large boulder to another without ever touching the soil. I did not see a single farm which would be ranked higher than a fourth-rate one either in the Lothians or in my own county of Fife; yet after I had completed my tour, I was told I had seen a fair average. The New England farmers are active and industrious, and doubtless the soil admits of vast improvement, but I suspect cultivation can never be generally carried on upon the large farm system. Granite and gneiss form the basis of the whole country, which is covered with their debris, yielding the poor soils that I have described. Volney was so far justified in saying "that all North America above Long Island is a rock of granite." But the poverty of the soil for agricultural produce will be afterwards better exhibited by comparison with other districts.

After reaching the White River, a branch of the railway to Burlington turned up the valley in which it flows. The country traversed was poor yet picturesque, and rendered pleasing by the frequent villages and beautiful villas. As we got near Burlington the land became more level, and was laid out in grazing farms, some of which appeared to be extensive.

CHAPTER II.

BURLINGTON TO NIAGARA.

3d Sept. 1854.—Burlington has a population of 8000, and is finely situated on the steep shore of Lake Champlain, which is here nearly eight miles in breadth. Many of the houses on the high ground of the suburbs are handsome, and command a view of the lake. This being Sunday, the town was remarkably quiet, and the population turned out well to church. I went to the Catholic chapel in the morning, and found it pretty well filled with a congregation of about 600. The greater number of the audience were apparently of Irish descent, and in general were remarkably well-dressed, though a few of the men had still the long brown great-coat, the peculiar garb of their native country. The bishop, a Frenchman, preached a most eloquent sermon, and from its tenor, it was evident that something more than the Maine Law was required to keep people sober. He had been preaching against intemperance on the previous Sunday, and now recapitulated the heads of his former discourse, and enforced his former exhortations. He told them it was a vice that existed to a fearful and lamentable extent, that he had warned them long, and remonstrated with them both publicly and privately, and if they still persisted, he would denounce the guilty by name in the church. One of the congregation had lately fallen a victim to intemperance, and he had felt it his duty to deny him the rites of Christian burial. The bishop had no notes. His voice, with a little of the French accent, was clear and musical; and as every sentence was toned with deep earnestness, and he made long pauses now and then, as if to allow his words to penetrate into their hearts, his eloquence became most impressive, while breathless silence

reigned among his audience. The latter part of his discourse related to a different subject. He urged parents not to send their children to the free schools, "where their morals would not be attended to, and divine science was not taught." The following day a Catholic school was to be opened, and he entreated them to support it.

Walking along the shore on Sunday afternoon, I saw some small farmers of French descent dragging the lake with a net for perch. This fish is very plentiful, but being worth little at this season, was to be given to pigs, as the drought had rendered Indian corn scarce and dear. The lakes throughout America swarm with fish of various kinds.

During my stay at Burlington, I visited a factory organised upon a plan new to me, but one that is common enough in the United States. A company in town have erected a large house 400 feet by 60, and of three storeys. A steam-engine of 150 horse power is placed in it, and the rooms are let at so much a foot, with a specified amount of power. The chief work carried on is cabinet-making, and the number of ingenious machines for cutting up timber was astonishing, and no less so was the rapidity with which the work was executed.

Left Burlington in one of the gay white painted steamers that ply upon the lake. It was nearly as long as the ocean steamer in which I had crossed the Atlantic. The fittings were superb, and the fare was excellent. On the west of Lake Champlain, the country is hilly, the shores are often precipitous, and chiefly covered with stunted pines and the never-failing birch. On the east side, however, there are considerable tracts of level land intervening between the lake and the mountains. The soil is a light-coloured clay, and similar in many of its qualities to the clay of the flats of the St. Lawrence opposite Montreal. There is only a small portion of the land in arable culture, the greater part being in hay or pasture. Small farms prevail in this district also, though some farmers have as many as 4000 sheep grazing in the woods and the low pastures.

Landed at the Fort of Tieonderoga, and drove about four miles through a valley, the soil of which rests upon the Trenton

limestone, a member of the Lower Silurian. The trees growing upon this narrow strip of limestone bounded by the granite rocks are chiefly oak and walnut. The steamer was waiting our arrival at Lake George, which is about 200 feet higher than Lake Champlain, and considerably narrower. The physical features of the country on both sides of Lake George reminded me of those at Loch Ness in Scotland; only the hills here are covered with a variety of broad-leaved trees. The scenery of Lake George is rendered still more beautiful by numbers of small wooded islands, and from the circumstance of no cultivation being visible on its banks. In the woods of this part of America, the rattle-snake is still very common.

Landed at Caldwell's Hotel, at the south end of the lake, where I found a highly fashionable company from all parts of the Union. I remained here a day and ascended one of the highest mountains in the neighbourhood, but the view from its top only revealed a hilly and wood-clad country, where there were only a few spots under cultivation. In every direction fires were seen in the forests, and the air was dimmed by smoke. None of the hills appeared to be above 3000 feet in height, and all were covered from top to bottom with trees.

An afternoon's ride by coach and railway brought me to the far-famed Saratoga Springs. The country, after leaving Caldwell's, gradually opens out, and before reaching Saratoga no mountains are visible in the distance. A considerable portion of the land has been reclaimed, or what is termed improved, but there is only a small breadth under crops. The soils are sandy or gravelly, yet the orchards of apple trees were everywhere, yielding abundance of fruit. Saratoga is a town of hotels, for almost every house was one; and the largest, the "American," can accommodate 1200 visitors. I lodged at the "Congress Hall," where the waiters were all negroes, and dressed in black pants and snow-white linen jackets. In performing certain parts of their duties, such as setting down the dishes on the table, and lifting the covers, they did so, at a given signal from the master of ceremonies, with all the regularity of the movements of a regiment of soldiers under drill.

The weather was excessively hot while I was at Saratoga, though there blew a stiff breeze from the south, yet the thermometer stood at 96° in the shade. A thunder storm came on at night with heavy rains, which cooled the air and rendered it more pleasant.

Saratoga is near the junction of the primary rocks of the north-eastern sea-board and the secondary rocks which stretch westwards far beyond the Mississippi. The primary formations north of Long Island and south of the St. Lawrence have an area of about 100,000 square miles, or 64,000,000 acres. They embrace the north-east corner of the State of New York, and nearly the whole of the New England States, *i. e.*, Connecticut, Massachusetts, Rhode Island, Vermont, New Hampshire, and Maine, besides the larger half of New Brunswick and Nova Scotia. The soil, as has been stated, is very poor throughout these primary formations, but this fact will be more clearly brought out when its productive powers are compared with other soils.

After spending two days at Saratoga, I took the cars for Albany on the Hudson. The country betwixt these two towns undulates in long stretches, no hills forming a feature in the landscape. No good land is passed, and where sands disappear coarse clays take their place. The Erie Canal terminates at Albany, and as it is the great channel through which the produce of the more fertile lands of the Western States finds its way to the eastern ports, this town forms a connecting link of an immense traffic, both of grain and merchandise. Huge steamers line the wharves, and flour barrels and piles of sawn wood cover acres upon acres. The town was originally a Dutch settlement, many of the houses are old and the streets narrow, and elegant mansions now crown the top of the sloping bank upon which it is built.

The chief formation in this part of the country is the Old Red Sandstone, which underlies an inferior class of soils. My next stage was from Albany to Rochester, a distance of 260 miles. After crossing the Mohawk the railway skirted along its narrow valley, which was the first stretch of good land I saw in America. This narrow strip of alluvial land I

always regard as the inlet to the immense expanse of, comparatively speaking, good land in the North-Western States and Canada West. For although I had often read of the general inferiority of the soil on the Atlantic sea-board, I had very indistinct ideas of its real character before I made a personal inspection. At first there is only a narrow ribbon of rich land along the Mohawk, bounded on both sides by steep slopes covered with a shallow and stony soil. The appearance of the country, however, is beautified by the remains of the broad-leaved forest; tidy farm houses also, surrounded by orchards, are thickly placed along the banks. Wheat is sown very early on the light lands, and it was already well braided. The only crop on the rich land in the valley is Indian corn, whose stalks rise to the height of eight or nine feet. As the river is ascended, the valley widens, and there is less under crop, while the beautiful meadows support large herds of cows.

Passed through the thriving towns of Rome, Utica, Syracuse, Geneva. The railway is usually laid down the centre of their wide streets. The engine, with its train of carriages attached, moves slowly through the most crowded thoroughfares, and a bell rings a death-knell to those who have not a good eye or ear. The only security or warning which the lieges have at the level crossings and in the streets, is a placard enjoining all to "Look out while the bell rings."

The country now becomes level, though its surface is undulating, and the trees of the forest attain a larger size. Oak and hickory grow together on those descriptions of land which are well suited to the growth of wheat. I remained for a short time at Canandaigua, where the sections of the railway exhibit a great depth of boulder clay, which usually furnishes a better soil in America than in Britain. The surface soil is not rich in vegetable matter, but it has the fine healthy red tinge that is usually so favourable to the higher class of vegetables. Some of the soils which are esteemed the best for wheat did not strike me at first as being of great natural fertility. But I soon came to understand that a good wheat soil in America is often very opposite in its characters from a good wheat soil in Scotland. I shall afterwards show that the peculiarities

of the climate in the two countries must modify our ideas on this question.

The cars were crowded with passengers, and those who did not keep their seats at the different stations were sure to find them occupied on again entering, and would have to stand for a stage or two. A farmer came in at one of the stations, who had been attending a Methodist camp meeting, at which about 3000 persons of both sexes had been engaged in religious exercises for four days in the woods, living all the while in tents. According to his account, these meetings have a social as well as religious character. He had enjoyed himself greatly, and was altogether a type of contentment and good nature. Another of my fellow passengers whom I sat beside was a Michigan farmer, upwards of sixty years of age, who had left home more than two years ago, with a capital of 1300 dollars; 700 were invested in a waggon and a pair of horses with which he crossed the country to Oregon. When the horses failed, he bought oxen, and drove to California, subsisting during the latter part of his journey on the game which he shot in the woods. After visiting the gold-diggings he sailed to Panama and thence to New York, and was now on his way home with scarcely a cent in his pocket. Though he had suffered many privations, he considered himself well rewarded by what he had seen.

Rochester is a fine city, more English in appearance than any town I had seen since leaving Boston. Thirty years ago it was scarcely worthy of the name of village, but now it has a population of 40,000. The houses are principally made of brick; the streets are wide, the elegant shops and large hotels indicate progress and the general diffusion of a high scale of comfort. The mills for grinding wheat on the Genesee River were the nucleus around which this busy and thriving town first formed and rose so rapidly, but now various other manufactures have sprung up. The Erie Canal also passes through the town, and affords the means of transporting its commodities.

The soil is somewhat stiff and stony in the vicinity of Rochester, but fruit trees also thrive remarkably well. The natural forest consists of beech, maple, walnut, and chestnut.

Towards Lake Ontario, which is six miles north of the town, the soil is of a light sand, not approaching by any means to what would be called a loam in England. This kind of land forms a belt extending along the lake for some distance, and is well adapted to the peach; indeed it is said this tree grows here as well as in any part of America. In going through some of the orchards I was surprised at the crops which trees only eight years old were bearing. They were standards, and every branch was literally bent towards the ground with its load of ripe peaches. The best peaches of a delicious flavour were selling at four shillings a bushel, while secondary kinds might be had for half this sum. About 120,000 bushels would be gathered this year in a narrow strip along the banks of the river. An orchard of 25 acres would realise the sum of £400, which appears rather small, inasmuch as the same extent of land in potatoes would yield more, for they were selling at a dollar a bushel. A peach orchard requires more attention than an apple orchard, as the ground is usually cultivated by the plough between the rows of trees. The ground, too, becomes sooner exhausted by, or unfitted for, the growth of peaches than of apples. It is a lovely and novel sight to one from the old country to see a productive peach orchard when the fruit is ripe.

I visited Hope Nurseries, which are the largest, I believe, in the world, extending over 250 acres of ground. Here one obtains some idea of the enormous number of fruit trees that are annually planted in the Northern States. America is a better fruit than grain country, and horticulture is usually a favourite pursuit among those who are engaged in agriculture. The firm of Berry and Company, who own these nurseries, frequently supply single orders for 100,000 apple trees to the western nurserymen, who retail them in the newly-settled districts. Apples grow upon a great variety of soils in America, but those which are adapted to pears are not so common; the latter require a rich soil containing a considerable quantity of clay, but the former produce abundantly on certain kinds of poor sands and gravels, though they are by no means ungrateful for rich land. The Isabella and Catawba grapes are the only kinds that ripen in ordinary

years in the north-western parts of the State of New York. A plant fitted for forming good hedges is greatly needed in America, as the zig-zag wooden fence is unsightly. I saw the Osage orange growing in the nurseries as a beautiful fence, but many still doubt whether it is adapted for this climate. The English hawthorn does not make a good fence in America, as it grows too rapidly and shoots up without thickening below.

The circulation of agricultural newspapers and periodicals throughout the Northern States is remarkable, and exhibits the effects of the diffusion of education among the agriculturists. The "Country Gentleman," at Albany, has a weekly circulation of 20,000; the "Rural New Yorker," at Rochester, 26,000; and in the same town, the "Genesee Farmer," a monthly periodical, has a circulation of 20,000. Besides these there are nearly a hundred agricultural and horticultural papers in the Northern States.

In company with Mr. Harris, editor of the "Rural New Yorker," from whom I received much kindness, I drove about twelve miles to the west of Rochester to visit some farms in the township of Riga. The sowing of wheat was going on very briskly on many of the farms that we passed, and on some it was already finely braided. Wheat is put in very early throughout Canada and the United States, and the plants tiller and are well rooted before the winter sets in. In this part of the country the farm horses are a superior class of animals, having a good deal of breeding, and being similar in figure and size to our carriage horses. They are very active, and a good team will sometimes plough $2\frac{1}{2}$ acres of light land in a day. It is common to put three horses abreast in the plough, and to make a furrow from 8 to 10 inches in depth and from 14 to 18 inches in breadth.

The system of cultivation which is pursued is interesting. The land does not strike one as being particularly fertile, but rather of middling quality. It consists of a light-coloured sandy loam of considerable depth and having some boulders strewed over it. But this soil seems to be as suitable to the growth of red clover as the limestone gravels of Ireland are to the growth of grasses, and hence its fertility is maintained

by clover as our fields in Scotland used to be by grass. The rotation that is followed is usually clover one year and wheat the next. There are few or no soils in Britain upon which clover would grow with vigour every second year; but were it not for this property of many of the American soils, much less wheat would be raised than at present. On the light soils in this region, I was astonished at the fine healthy plants of clover in the wheat stubbles. When the autumns are somewhat moist a considerable growth of clover takes place before winter; but the farmers do not like to pasture it too close. An intelligent farmer informed me that the common clover would last for ten or fifteen years on these soils if it was cut early in the season and not allowed to seed. By the system at present pursued, the farmers in this district cannot keep a large herd of stock, and the clover fields are worth little money, being chiefly of use in renovating the land.

The clover fields are prepared for wheat by being deeply ploughed in June, and the surface being afterwards worked by the harrow and the scarifier to destroy the weeds. Though this system sacrifices a vast quantity of valuable forage, yet, in the circumstances, it is perhaps the best that can be followed, for it admits of the wheat crop being frequently repeated, and involves but a small amount of manual labour, which is the element that determines the agricultural systems of America.

The farmers in the Riga district sow about one-third of the whole extent of their possessions with wheat every year. It is the best paying crop, and every one endeavours to have as great a breadth of it as possible. The ploughing up of the clover sod and the cultivation of the surface is called "fallowing," which is a less expensive system than what goes under the same name at home. The winters are very severe, and field labour is then entirely interrupted; but the short season for labouring and cleaning the land is more than compensated by the powerful influence which the hot summer weather has in destroying the perennial grasses and weeds. These are readily killed by being ploughed up at that season and having their roots exposed to the heat and drought. In this way is the land kept clean by the best farmers in the north-western

part of the State of New York, which is perhaps the most productive region for wheat in North America. No clean fallows nor any expensive fallow crops, such as turnips, are necessary to keep the land in good condition and free from weeds.

On one of the Riga farms which we visited, extending to 230 acres, we found 80 acres in wheat, $11\frac{1}{2}$ in barley, 14 Indian corn, 25 woods, the rest pasture and clover. In 1853, the crops of wheat averaged 40 bushels to the acre; in 1854, only 25 bushels. As indicating the natural capabilities of the land, we were shown a field on which a heavy crop of Indian corn had grown in 1852, it was sown next spring with barley, which produced 50 bushels to the acre, then sown with wheat in autumn, and this year it had yielded 40 bushels per acre. On this farm a field of clover was in course of being ploughed up and sown with wheat; it had been in wheat this year, but the farmer was complaining that the plant of clover was bad, while in our opinion it was a most excellent one. Mr. Harris remarked that this was surely a mere excuse for getting a little more sown with wheat, while the prices were good: 100 sheep are kept on this farm, besides 10 or 15 cattle, which are reared and sold when two years old.

On another farm of 208 acres there were 40 in woods, 12 permanent pasture, 7 Indian corn, 12 oats, 10 pease, 65 wheat, the rest in clover. About 1000 bushels of wheat were thrashed this year, 500 last, and 2000 the year before. The seasons appear to influence the yield of wheat far more than they do in Britain. The flock of sheep yielded 400 dollars last year. Leicester sheep do not seem to thrive well where so much of the land is cleared, for frequently the whole flock are seen during the heat of the day standing crowded together with their heads all down.

It is almost the universal practice to sow clover among the wheat in spring, and at the same time to give the field a dressing of 100 lbs. of gypsum, which has a wonderful effect on some crops. The clover is benefited more than any other plant; though pease, potatoes, and Indian corn have often new life imparted to them by a light dressing of this substance, which is almost the only artificial manure used in the Western

States. The manure of the farm is applied to Indian corn, which is perhaps more grateful than any other crop for liberal treatment.

12th September.—Took the stage-coach this morning for Geneseo, a distance of thirty-three miles up the Genesee river, over a rolling or undulating country, where the soil is generally light and stony. This is the well-known Genesee valley, which is one of the best districts for wheat in North America.

Five members of the Silurian and Devonian formations crop out betwixt Lake Ontario and a little to the south of Geneseo. These consist of sandstone, limestone, and aluminous shales; and having been subjected to the denudating action of those agencies which have transported and heaped up such enormous quantities of drift materials over this part of the country, there is often a complete mixture of the debris of these different members in the surface soil. The wheat soils to the south of Lake Ontario may be divided into three classes:—1st, sandy loams; 2d, gravel soils; 3d, soils resting on the boulder clay.

The Riga soils which I have already described belong to the sandy loams. The most of those over which I passed from Rochester to Geneseo are derived from the decomposition of the drift gravel. They had the appearance of being anything but rich soils, for they are of no great depth, and full of water-worn stones. In the township of Caledonia, which is chiefly farmed by Scotchmen or their descendants, the soil is light and gravelly, and wide piles of stones lie around the borders of many fields, monuments to the industry of the owners. Notwithstanding appearances, I was told that wheat and clover are as sure crops in that township as in any other within the State; and I can bear testimony that the young layers of clover were truly beautiful. The farmers here, as in Scotland, have learned to judge of the character and quality of the land by the kind of stones that are strewed over it. In the Genesee country, hard and flinty stones are regarded as indicating that the soil is well suited for the production of wheat and clover. Soils which are derived

from the boulder clay are capable of growing the largest crops of wheat and barley, but they require a great deal more labour to cultivate them. These clay soils are by no means rich in vegetable mould, but have a fine healthy red tinge derived from the oxide of iron, which the eye of practical men look upon as being associated with something that promotes the healthy growth of every crop that is cultivated.

The valley of the Genesee, therefore, is not, as I had imagined, a wide, level, and rich champaign, but an undulating and rolling country, made up of hillocks of northern drift and of boulder clay, covered with a soil of very moderate fertility, but favourable in this climate to the growth of wheat and clover. As I drove along the stage road I had a peep now and then of the interval lands along the margin of the river, which go under the name of the Genesee flats. This tract of rich level land, varying from a few yards to a mile and a half in breadth, is mostly in meadows, and when cropped is much better adapted for Indian corn than wheat, owing to the latter being liable to grow too strong or to rust on such rich land.

I observed in my drive to-day that the wheat stubbles on the light gravelly soils were almost invariably well planted with clover, but in some of the clays it was otherwise, in consequence of the drought in the early summer being unfavourable to the germination and rooting of such small seeds as clover. When the clover fails, another crop of wheat is taken. There is still much fine wood left in this part of the country, and it imparts a rich appearance to the landscape, which is everywhere bounded by what appears in the distance an unbroken forest. But the picture is generally marred in the foreground by withered permanent pastures.

Genesee is a neat little town of 1000 inhabitants, situated on the east or right bank of the Genesee, and commands a view of the rich flats and the finely wooded arable lands to the westward. Mr. Wadsworth resides near Genesee, and owns about 30,000 acres, stretching from this town towards Rochester, the most of which he lets to tenants on annual leases, but some of it he cultivates on his own account. The system of cultivation which is adopted on the wheat soils of this region

is the same as in the Riga district, where wheat and clover are sown alternately.

The flats of the Genesee are very fertile, so much so that crops of Indian corn can be planted upon them for twenty years in succession. If such land is let for wheat crops, 12 bushels are given as rent, but the produce is uncertain, varying from 18 to 40 bushels to the acre. Large ploughs drawn by four oxen were in a field of wheat stubble in the flats, turning over a furrow 8 inches in depth by 14 in breadth. It was to be again sown with wheat, though in other fields the braird was already 3 inches in length. Early sowing is the most approved means for guarding against rust and mildew. Indian corn would not produce more than 50 bushels this year owing to the great drought, but crops of 70 and 90 bushels to the acre are not uncommon.

The meadows yield particularly fine pastures; a hundred acres will graze seventy-five head of four-year-old cattle from the 15th May to the 1st December. In one of Mr. Wadsworth's fields I saw a large herd of Durham cattle, the greater number of which were bred in Kentucky. Some of them had travelled eight hundred miles by railway, at a cost of twenty-nine shillings (seven dollars) each. They can be driven that distance at half the expense and in as good order, but the railway has the advantage of saving time. Mr. Wadsworth's manager brought some salt with him in his gig, and we were soon surrounded by the whole herd, which licked it up with great avidity when it was thrown down upon the grass. Throughout the Western States and Canada, cattle and sheep are very fond of salt, and though they often run almost wild in the woods they return at intervals for a supply. The week previous to the time of my visit 120 cattle had been sold out of these pastures at £17 a head. Among the natural grasses in the pastures, cocksfoot and timothy were conspicuous, and seem to be the most valuable grasses that have been imported from Europe. The best meadows yield three tons of hay per acre. For this land seven dollars per acre are charged when the crop is to be cut, and five when pastured. The value of these meadows is 120 dollars per acre, so the rental which they yield is but

a small return for interest in a country where six per cent for money can be got on good security. Cattle are not housed here during winter except those that are fattening. They run about the meadows and find shelter among the woods. Store cattle have hay, straw, and the stalks of Indian corn supplied to them; while those that are fattening have Indian-corn meal in addition. Six pounds of meal a day are at first allowed to each beast, and the quantity is gradually increased until eighteen pounds are given. Such high feeding, though often practised, does not, it is said, pay. Cattle are considered to remunerate the grazier if he has two guineas (10 dollars) a head for pasturing them in the uplands during the summer.

One farm that I visited in the neighbourhood of Genesee was 207 acres in extent, of which a considerable portion was rich interval land. There were 50 acres in wheat; 50 in Indian corn; 30 permanent pasture; remainder clover. Another farm on the higher grounds, of 240 acres in extent, had 75 in woods; 50 wheat; 50 clover; 5 Indian corn; 17 barley. The stock on the farm consisted of 11 cows; 10 calves; 6 year-olds and 11 two-year-olds. I was told by the owner that red clover was not sown in this district before 1829. Previous to that date no grasses were sown, but then the white clover always came up naturally in the wheat stubbles, and the land was allowed to remain two years in pasture. But since the practice of sowing red clover has become so general, the white clover does not come up so freely in the wheat stubbles when the red is not sown. The introduction of red clover has thus allowed wheat to be raised on these shallow soils once in two years instead of once in three.

Oak and hickory are the principal trees in the forest, where the soil is most suitable for the growth of wheat. The butternut and the walnut are only sparingly distributed in the forests. In other parts of this region, again, where the sub-soil is of a compact sand, the maple and the beech divide the land betwixt them. Maple and beech land is not so good for wheat, as there is usually more accumulation of vegetable matter, which renders it too soft, so that the plants

are more liable to be thrown out by the spring frosts, and the crop on such land is also more subject to rust and mildew. The beech and maple land, however, is well adapted for spring or summer crops, such as barley, Indian corn, and potatoes.

The adaptation of soils to the growth of various kinds of trees is rather an interesting and curious question to which I shall have frequent opportunities of directing the attention of my readers. Dr. Lindley, I believe, was the first to suggest that the distribution of forest trees over particular soils was regulated more by the physical condition than by the chemical composition of soils. In the general truth of this opinion I quite concur, and it is amply borne out in the facts which I have just stated regarding the oak and hickory, and the beech and maple soils; inasmuch as the adaptation of the first to winter wheat, and the last to spring crops, shows that it is the physical condition that determines the fitness of the soil for cultivated crops; for we have only to bear in mind that winter wheat, barley, oats, and Indian corn, are identical in chemical composition. In both varieties of soil the chemical constituents which are necessary to the growth of beech, maple, oak, hickory, wheat, barley, maize, and potatoes, are present, but the physical condition or mechanical texture of the two is different. This difference in the texture of soils seems to have a corresponding influence upon the healthy functions of certain kinds of trees, with that which an undrained and marshy soil is well known to have in this respect.

The universality of a system of cropping over a wide tract of country affords a strong presumption that it is about the best that can be followed under all the circumstances. The more I have thought of the Genesee system of cropping, the more have I seen cause to admire its economy in manual labour—a dear and scarce commodity in America. It would require one better versed than I am in the nature of the soil, climate, and markets, to suggest improvements upon it. It ought to be borne in mind that a few years ago the prices of cattle and sheep were low, and little encouragement was held out to rear and feed stock. Now, however, the high rates of butcher meat will probably have a tendency to restrict the

extent of land under wheat, by offering a premium for allowing the clovers to lie two years instead of one, and no doubt better crops would be obtained on a smaller area. But during the last few years the rise in the price of wheat has been as great as in the price of animals, which in the meantime serves to perpetuate the old rotation of clover and wheat in alternate years, and thus comparatively little attention has been paid to the breeding of sheep and cattle on the wheat soils; though I believe the best farmers are now inclined to pursue a somewhat different course.

Notwithstanding the severe cropping to which the Genesee soils have been subjected, I think that they are not so much in need of extraneous manure as of proper cultivation. The difference in the appearance of one farm from another, arising from the manner in which the mere acts of culture had been performed, was particularly marked. In the meantime, properly cultivating and cleaning the soil seems to be a very obvious means of increasing the produce on many farms, even although the land does not impress one with its productive capabilities.

The rent of the best wheat land is from six to eight bushels of wheat per acre, but rent is only paid for what is under this crop. The wheat soils that are planted with Indian corn usually let at one or two dollars an acre, but more frequently no rent at all is charged. Indeed, Indian corn on the common soils of the north-western parts of the State of New York is an expensive crop to raise, for it requires much hand labour; but, on the other hand, the land is cleaned and fallowed during its growth as our own fields at home are under turnips. On none of the wheat farms did I find it cultivated to any extent; and on my asking the reason of this at a farmer one day at Batavia, he assured me that one man and a boy would manage fifty acres of Indian corn as easily in Ohio as they would ten acres in this part of the country. He could not give me reasons for this assertion, and at first I thought it was much exaggerated, but after getting to Southern Ohio I found that it was pretty near the truth. This subject will be afterwards alluded to, for it will serve to show how the systems of farming in America

are regulated by the question of labour and differences of climate.

In the Genesee country, where from six to eight bushels of wheat are got as rent for land sown with this crop, the *land in clover does not pay any rent*. In one of Mr. Wadsworth's leases which I saw, the tenant was restricted from pasturing the clovers until the 1st June, that is, until it was about the time that the tenant required to begin to plough the land in order to prepare it by "fallowing" for wheat. Thus no encouragement is given to pasture the land with stock, and, indeed, so far as the principle of strict economy in manuring is concerned, it is a sound one, for the more that the clover grows, the more it must enrich the land when ploughed under.

On the richest soils adapted for wheat in New York State, Indian corn is often taken after the clover, and barley is then sown; but, as already stated, Indian corn is only raised to a small extent on the lighter wheat soils. Those districts that are adapted to the growth of wheat are not economically adapted to Indian corn, though this crop is cultivated both on the poorest and on the richest land. The New England farmers find that it is more grateful for labour and manure than wheat when their soils are not genial to the growth of clover.

In many of the rich valleys of the State of New York, such as the Mohawk, Indian corn is often cultivated on the same land for many years in succession. On these soils it is said to produce on the average of years double, or even triple the number of bushels on an acre that wheat will do, for the latter is a most uncertain crop on all rich and loamy soils, in consequence of its liability, in the hot and humid periods of this summer climate, to rust and mildew, from which diseases Indian corn is entirely exempt. Indeed, throughout the American continent, wheat only grows well upon soils of moderate fertility, and such as are rather deficient in vegetable matter. This inferiority of the climate of America for the growth of wheat upon rich soils, is counterbalanced, however, by the superiority of its growth upon second-rate ones. I am quite satisfied, that with the same treatment, the light

gravelly soils of the Genesee valley would be much less productive of wheat in England or Scotland ; but then I doubt if the resources of the American climate are so great as those of the British, for raising the produce of wheat on the Genesee light soils. The variations in the character of the seasons in America, as already observed, influence the produce of wheat to a great extent. In some years the yield will be as low as ten bushels an acre on the lighter lands, and in others as high as thirty-two. The productive powers of the wheat are no doubt more limited in America than Britain, for in the former, stimulating manures cannot be applied so freely as in the latter. In confirmation of this view, I may cite the opinion of Mr. Coleman, who justly remarks that the lower temperature of Britain is favourable to large yields of wheat, in consequence of its growth being extended over a longer period, on the same principle that turnips grow to a larger size in a cool than in a hot climate.

Considerable quantities of an elegant variety of maize, called broom corn, are cultivated in the rich valleys of the State of New York. The seeds, instead of being large and clustered around the cob, and protected by a sheath as in the common varieties, are attached to the end of tough fibres nearly a foot in length. From the circumstance that handsome and useful brooms are made out of these fibres, it has derived its distinguishing name. The seeds being too bitter for making bread, are chiefly used for feeding pigs and poultry. They have also been tried for distillery purposes, but the essential oil imparts an aerid flavour to the spirit. More hand labour is required for its cultivation, as in its early stages it is more delicate, but during the warmth of July and August it rushes up with great rapidity, and soon overtops the other varieties.

To understand the spirit of American farming, the high price of labour must be constantly borne in mind. In the Genesee country, many of the farms have nearly one half of their arable land in wheat every year ; yet this large extent is obtained at little expenditure of labour. I heard some farmers maintain, that two men and six horses would, under this system, manage one hundred acres of wheat, that is, cultivate the land,

thrash, and take the produce to market. This is certainly much more than is usually done, but the small number of hands on the Genesee farms is a characteristic feature of their management. If it had been necessary to have one-fourth of the land in turnips or any other equally expensive cattle crop, the value of these soils would have been greatly less than what it is. As already stated, the land is kept in good condition by sowing red clover, and also free from weeds by ploughing in summer, and afterwards scarifying the surface. By this system no expensive manures, with the exception of a little gypsum, are required, and the soil is kept almost as clean by one ploughing in June or July as if it were bare-fallowed for a whole summer in Britain. It is difficult to see how the present system can be greatly altered until the wages of labour are considerably diminished.

Our common thistle, called here the Canada thistle, is a great pest in the arable lands, which, when overrun with it, are bare-fallowed out and out for a summer. By a clause in Mr. Wadsworth's leases, his tenants incur a penalty of a dollar for every thistle allowed to run to seed; but judging from the numbers growing over his property, this is surely never put in force. In the Indian corn fields, an annual grass called June grass grows up with great rapidity during the hot season, which requires the hoe to be frequently used to keep it in check. On the whole, however, arable lands are far more easily kept free from weeds, perennial especially, than they are in the moist climate of Britain.

The greater part of the State of New York is exceedingly poor. The country immediately to the south of Genesee gradually becomes higher and more irregular in its surface, and by no means fertile. Being deficient in calcareous matter, clovers grow less freely, and weeds are more difficult to eradicate. The staple crops in that part of the State of New York, as in New England, are Indian corn, barley, and oats, but the land in tillage is limited, for dairy pastures are found to be more profitable. The soil is also generally poor in the eastern part of the State; a gentleman, well acquainted with the agriculture there, assured me, that there was seldom more than one-tenth of the arable land in cereals, and the crops entirely

fail when a much larger extent is kept in cultivation. If our readers will take a glance at the map, they will at once see how limited the wheat region is in the State of New York.

I was by no means impressed with the fertility of the soil in the township of Riga; yet in consequence of the nature of the climate, and the adaptation of the soil for clover, a large quantity of wheat is raised on a very limited area. Though this township only contains 36 square miles, or 23,040 acres, it produces more wheat than the State of Massachusetts, which has 2,133,436 acres of what is termed "improved lands." The county of Monroe, of which Rochester is about the centre, with a total area of 720 miles, or 460,800 acres, produced 1,441,653 bushels of wheat in 1850, while the six New England States, Maine, New Hampshire, Vermont, Massachusetts, Connecticut, and Rhode Island, with a total area of 11,147,096 acres of "improved land," only supplied 1,090,845 bushels. Indian corn luxuriates on rich soils, but it is also more grateful than wheat for liberal treatment on the poor. The preference given to the culture of this crop on poor land is sufficiently indicated by the fact, that the New England States produced 10,175,865 bushels of Indian corn, while the county of Monroe only produced 767,021 bushels.

In the wheat region south of Lake Ontario, the farms are usually from 150 to 300 acres in extent, though many are much larger. The farm houses are roomy and comfortable, impressing one favourably with the condition of the occupants. The female members of the family have ample employment in the cleaning and cooking departments, and the table at the different meals is loaded with a profusion of dishes. House servants are dispensed with as far as possible. Butcher-meat appears at breakfast, dinner, and supper. The Americans no doubt eat a vast deal too much of such stimulating food. Indeed, I do not think that any class in England consumes so much butcher-meat as all classes do here.

It is a remarkable circumstance that farms have a tendency to decrease in size more rapidly where the land is poor, than where it is rich. The explanation of this seems to be that the families who are located on poor soils never attain

to affluence however industrious they may be, and the value of their property increases but little. Labour is better rewarded on good land, which enables its owner to give his family an education suitable for other trades or professions. Thus the tendency to subdivide the land is so far counteracted in productive districts. The average size of farms in the poverty-stricken New England States is about sixty-seven acres of "improved land," of which only a small proportion is under cultivation. This tendency seems at length, however, to be arrested, for farms are now very seldom subdivided in these States on the death of heads of families. In the present condition of the country they seem to have nearly reached their minimum size.

I took the stage-coach from Geneseo to Avon ; the road is on the east side of the river ; the soil is stronger and not so well cultivated as where it is lighter. Got the railway cars at Batavia Station, and reached Niagara village late at night.

CHAPTER III.

UPPER CANADA.

15th September 1854.—On going out in the morning, a deep thundering noise filled the air ; and I felt considerably excited at the prospect of soon seeing the far-famed Niagara. The first view I got was of the American rapids above the falls. It was the largest body of fresh water I had ever seen dashing along at such a furious rate. Crossing by the wooden bridge to Goat Island, I soon had a full view of the mighty cataracts, which afford a spectacle far beyond any description of mine. I would advise those who visit the Falls for the first time to do so from above, on the British side, where the rapids are seen in all their grandeur—a sight only second to that of the Falls themselves. The great breadth of the river above the British fall, and the wild and tumultuous manner in which the water is broken in passing over the rocky bottom, resembles the Atlantic lashed by a storm. I can hardly imagine how any one can be otherwise than overawed by the extraordinary scene if he approaches from above, and looks from the Table Rock into the boiling cauldron. But probably he may be rather disappointed if he chance to get a first view from the suspension bridge about a mile below, for at such a distance the cataract is somewhat dwarfed, and the river is confined within a deep and narrow channel. After spending two days at the Falls, and viewing them from different positions, I was loath to leave the scene.

The country is finely wooded in the Niagara district. It is part of the vast plateau which stretches westwards on

both sides of Lake Erie, through Upper Canada, Ohio, Indiana, Illinois, Michigan, and even beyond the Mississippi into the state of Iowa, and territory of Minnesota. In Upper Canada the northern limit of this plateau is pretty accurately indicated by the boundary which I have given to the wheat region on the map. To the north of this the country is granitic, and the soil as poor as in New England.

The Niagara river has a course of 34 miles from Erie to Ontario, and in this distance it falls 322 feet. At the rapids the descent is about 60 feet in a mile, and at the Falls the river is precipitated over a ledge of rocks 160 feet in perpendicular height. Geologists are generally agreed that the Falls were at one time at Queenstown, seven miles below, and that this recession has gradually taken place in consequence of the river undermining and wearing away the rocks over which it flows. The table land terminates at Queenstown in an abrupt escarpment, which forms the "heights" where the battle of 1812 was fought, and in which General Brock fell. A level tract of land of about seven miles in breadth intervenes between the town and the lake. This low-lying land is heavily timbered, and from the heights has the appearance of being an unbroken forest; the soil is a tenacious clay, well adapted for wheat and clover, but somewhat difficult to labour. On the mountain, as the table-land is called here, the soil is usually light, and moderately productive.

I paid a visit to several farms on the Canadian side in the neighbourhood of the Falls, and found the land to be of a light and useful description. Wheat is the staple crop, but it is not repeated so frequently as in Genesee, nor did the soil seem to be so genial to the growth of clover. The land is commonly pastured three years before wheat is sown, and during the last year timothy grass predominates over the clovers. The common practice is to break up the grass fields before winter; to give two furrows during summer, and sow the wheat in autumn. Under this system the extent of wheat is much restricted, but cattle, and dairy produce form much larger items in the farmer's receipts than in the Genesee country. Indian corn is cultivated to a small extent; all the farmers spoke of it as being a valuable crop. The

only objection to it was, the great amount of manual labour that it requires to cultivate it and keep the land clean; and really many of the fields were overgrown with weeds.

Got the Peerless steamer in the afternoon from Queens-town, and in little more than three hours we were alongside of the wharves of Toronto, which is the finest city in Canada. The wide streets, containing splendid shops, and numbers of handsome churches, conspire to impress one with the thriving character of the place. With a friend I went over the schools, which rival those of the United States for efficiency. The College, too, has been liberally endowed, and provides the means of prosecuting more advanced studies than what the common schools afford.

Toronto has increased greatly within a few years, and it now contains upwards of 45,000 inhabitants. The removal of the seat of government did not check its advancement, for after all, the mere residence of a number of provincial members of Parliament can do little to raise up a town. In fact, the progress of any of the towns along the Canadian shores of the lakes depends upon the agricultural capabilities of the surrounding country. Toronto is merely the exporter of the produce of the district that lies betwixt Ontario and Lake Simcoe, and the importer of the necessities and luxuries that the settlers require. Had the soil to the northwards been no better than the greater part of Massachusetts, Toronto would not have extended her wide streets so far into the bush.

I started early one morning from Toronto, and went by railway to Lake Simcoe, a distance of fifty-five miles, and had a pleasant sail down the lake for another forty miles. The low banks are wooded to the water's edge with beech and maple, mixed with pine trees, the soil being in general too stony to form any inducement for settlers to clear it.

Betwixt Toronto and Lake Simcoe, the white pine predominates, which thrives upon a light sandy loam. The clays, on the other hand, are covered with the beech, maple, and birch, while cedars grow upon the marshy ground. The

regularity with which the various kinds of trees have got possession of the different soils is remarkable.

The clearing of the forest was everywhere going on, and was seen in all stages of improvement, from the blackened stumps, standing as thickly over the ground as the trees had once done, to the well-ploughed wheat-field. To clear land is not quite so formidable an operation as at first sight it appears to be; and the settlers soon find out the easiest methods for effecting this desired end. The trees are cut down, and the stumps, three feet in length, are left standing; as much of the brushwood is then burned as possible, and the larger logs are afterwards piled into heaps and consumed. A combination of labour is requisite for this last operation, and the settlers in a district turn out and assist each other at this work, which goes under the name of "log-rolling."

In this district Swedes or oats are sown on the charred surface for a first crop, all the labour that they require being merely to harrow in the seed with some bushes. A crop of wheat is also taken without any ploughing, and the land is sown with clover and timothy grass, and then pastured until the roots of the trees become so far decayed as to allow the land to be ploughed. The length of time that elapses before a field is fit for ploughing after the trees are cut down varies much with the kind. In six years the roots of the beech and maple, which run along the surface, are so much wasted that the plough can go through them; and though the roots of the oak are more durable, yet they run deeper into the soil, and allow the plough to approach nearer to the stumps. In many cases fields are often ploughed and sown when they are thickly planted with stumps. Owing to the quantity of rosin in the roots of the pine trees, they decay very slowly, and it is from twelve to sixteen years after the trees are felled until the land can be cultivated.

I met a farmer, a native of Devonshire, on the railway, who resided in the township of Georgina. He spoke highly of the country and its capabilities, and said that some of the best pasture-land south of Lake Simcoe rents at eight shillings an acre. A great rise in the value of cattle and

sheep had taken place within a few years, in consequence of the opening up of the markets by the railways. A sheep weighing sixty lbs. the four quarters was worth £1:2s. sterling, and an ox of 800 lbs. £11:15s. These high prices had already given a great stimulus to the improvement of the breed of stock. His farm was 200 acres in extent, of which 60 were in wheat (one-half autumn and one-half spring sown), 5 turnips, 1 potatoes, $\frac{1}{2}$ Indian corn, 16 pease, 25 oats.

After having had a very pleasant run of nearly 200 miles by railway and steamer, I returned to Toronto about nine o'clock. Yesterday evening (19th September) at this hour the thermometer stood at 66° in the open air, but to-night it is down to 46° with a northerly wind that has prevailed all day and made it piercingly cold. The frequent and sudden changes begin to give warning of the approach of winter. No sooner, however, does the southerly wind again blow than the air becomes delightfully warm in the evenings.

Left Toronto on the 21st, by the steamer for Hamilton, another of the thriving towns in Canada West. Sailing at no great distance from the shore, a good view is got of the country, which almost appears an unbroken forest, for the land being covered with pines and rather poor along the shore little is cleared. Here and there, however, wide spaces have been cleared and extend from the lake into the interior, where the soil is more fertile.

Shortly after leaving Toronto, the spray from Niagara Falls, with a cloud constantly hanging over the spot, was easily recognised, though forty-five miles distant. Hamilton is a prosperous town situated on the lake and extending to the foot of the steep escarpment of the formations that compose the mountain or table land, which I have already described as seen at Queenstown. From its sheltered situation, it is often oppressively hot in summer.

My first stage, westward from Hamilton by the Great Western Railway, was as far as Paris, a distance of thirty-six miles. The railway gradually rises to the level of the plateau through a narrow valley finely wooded, but the surface is too broken to be generally settled. There is no great extent of cultivated land seen until Paris is reached, where

a considerable tract is cleared in the plains of Dumfries, and forms the best district for wheat that I saw in Canada West.

This district, about eight miles in length by six in breadth, is entirely covered with vast beds of gravel and sand, derived from the primary rocks and the Silurian limestone. The whole is covered with a light sandy loam, which seems to have been formed by the decomposition of these materials. The soil appeared fully as good as that of Caledonia in the State of New York; but the clovers were rather inferior, though some were beautifully planted. Gypsum is used successfully here for clover and several other crops. Some of the farming is particularly neat and tidy; indeed, I saw none more so in America. On the farm of Dudingston, possessed by Mr. Ballingal, better cultivated fields I could hardly imagine. The farms are commonly about 200 acres in extent, and the houses and orchards indicate that the occupants are industrious and thriving.

The mode of culture is very similar to what is followed in the Genesee country, but the wheat crops are not in general taken so frequently. But here, also, alternate crops of wheat and clover are often taken; the land, as in Genesee, is deeply ploughed in June and July, and the weeds are destroyed by scarifying the surface, thus avoiding the old and less economical system of fallowing out and out for a whole season. The crops on one farm of 140 acres arable land were 50 acres wheat, 16 in pease, potatoes, turnips, and Indian corn. Two men and four horses cultivate this extent of land, with a little additional labour at harvesting. I saw some excellent crops of Indian corn in this district; but here again the complaint was, that it took too much labour, and therefore it was only a small extent that farmers found convenient to cultivate.

It is the more general practice, however, to allow the land to remain for two years in pasture (artificial grasses and clover), to break up in June, and sow in autumn. Below Paris I inspected an excellent farm, consisting of 250 acres of clay loam, on which a good deal of stock was kept, and there were only from 30 to 40 acres usually in wheat. The land is pastured for three years, and produces fine grasses that become

thick and strongly rooted. It is then prepared for wheat by ploughing in autumn, sowing with rape in May, and after this last crop is eaten by sheep, it is fallowed and sown in autumn. How far this system is preferable to the more frequent cropping with wheat, I do not pretend to decide. An excellent flock of South-Down sheep was kept, and this year the one-year-old wethers, weighing 22 lbs. per quarter, brought two guineas on the farm, but realized £2:8s. in the New York market—another striking instance of the advantage that Canada has derived from the opening of railway communication.

Rust and mildew are the great enemies which the Canadian farmer encounters in raising wheat, and these diseases are far more common on new than old cultivated land. In Canada, as well as throughout the United States, land becomes better suited for raising wheat after the richness is partly worn off. The best preventive of rust and mildew is to sow early, for if the crop is late, the heats of July are apt to ripen it prematurely at whatever stage of forwardness it may be. Though it is only the 23d September, the sowing of wheat is generally concluded in this district; the greater part of it is already above ground, and in some fields the plants are tillering and looking beautiful. The crops of wheat on the best light soils vary from 18 to 30 bushels to the acre, and on the clay land 40 are sometimes got.

The value of land has advanced of late very considerably in the plains of Dumfries. Seven years ago a farm, a few miles from Paris, consisting of 175 acres, long advertised at £7:10s. per acre, was sold this year for £15. The usual increase, however, of value in farms worth £7 per acre three years ago, is that they are now worth £11; but of course the rise in the neighbourhood of the towns has been enormous. Large fortunes have been made by speculating in land in Canada, but there are often disagreeable circumstances connected with this business, for poor emigrants squat down upon it, and great difficulties are experienced in removing them. One of the wealthiest lawyers in Canada confessed to me, that he had always found it advisable to compound with squatters.

25th September.—I visited some farms on the Grand River, near Dunnsville, about four miles from Lake Erie. The branch of the railway that connects Paris and Dunnsville is one of the feeders of the Great Western Railway of Canada, which forms the shortest route from New York to Detroit and Chicago. The principal stream of emigrants from Europe flows along this line towards the western territories. The distance from Paris to Dunnsville is about forty miles, and the country for the most part is still in the original forest, having considerable tracts of swampy ground, upon which the tamarack and the cedar grow. At Dunnsville the Grand River has been dammed up to act as a reservoir for the Welland Canal. This has had the effect of converting the lower part of the river for more than twenty miles into a vast lake. The withered trunks and larger branches of the trees which grew on the level land adjoining the river are still standing, and give a forlorn appearance to the country. The town is very unhealthy, the great majority of the inhabitants having ague every year. It was painful to see the pale and sallow complexion so universal, and the ague invalids so numerous.

Drove about six miles up the east bank of the river. The country was by no means fertile, and little wheat was seen; potatoes, oats, and buckwheat, being the staple crops. Having occasion to cross the river, about three-fourths of a mile in breadth, I prevailed upon an Indian, who was thrashing grain with the flail in a barn, to row me over in his canoe, which was cut out of the trunk of a tree. He was about thirty years of age, dressed like an ordinary labourer; eyes and hair very dark, though his complexion was not more so than that of many Spaniards or Italians. His features were finely formed, and the expression of his face was soft and pleasing; in fact he was, as many of the young Indian men are, altogether good looking; but the women, old or young, do not approach by any means to our European notions of beauty, at least all that I saw had rather repulsive features. The canoe was not more than two feet in breadth, and with a cargo of three persons it was heavily freighted; I was glad when I reached the other side in safety, as little would

have upset us. The south wind had once more rendered the weather delightfully warm, and the evenings most charming.

The country is more rolling on the south bank of Grand River, and the soil is also better, consisting of a light sandy loam, though having rather too much vegetable matter in it to be good for wheat. Beech and maple predominate in the forest, and the farmers have long ago found out here, as well as in New York State, that such land is better suited for spring and summer crops than for autumn-sown wheat.

On the more sandy descriptions, a system of cropping is followed similar to that in the Dumfries district. Here, a farm of 204 acres, of which 95 were cleared, had 25 acres in wheat, 10 oats, 3 buck-wheat, 6 Indian corn; required four horses to cultivate the land and drive the produce to market. Its value was about £1800 sterling. Twenty head of cattle were kept, besides thirty sheep.

I found the owner of this farm, Mr. Edie, a jovial hearty fellow, who had settled here in the bush sixteen years ago, superintending and assisting his men at "log rolling," and burning the remains of a portion of the forest that had been recently cut down. The land was to be sown with wheat this season. I happened to remark that, before he could get the land into a proper state to sow wheat, the season would be too far gone, when he told me that wheat could be sown much later upon new land than upon what had been in cultivation for some time. The reason he gave for this was, that the richness of the newly-cleared land forced the wheat to grow rapidly and longer in the autumn, and thus to make up for late sowing. This, I think, is a very rational explanation of a practice that seems well understood among Canadian farmers; and it perhaps may serve to give us some insight into the peculiarities of wheat culture in America, incident to the peculiarities of the climate.

Some days after this, I met a farmer who had emigrated from Fifeshire nine years ago, and whom I formerly knew. He had 100 acres of cleared land, most of which was a light loam, resting upon gravel. Upon this extent he had 50 acres in wheat, his usual crop being 1000 bushels. He

informed me that all his ideas respecting the nature of the soils best suited for wheat were completely changed since he came to Canada. Wheat, he said, was not so exhausting a crop in Canada as in Scotland, as it could be so easily raised on very light soils ; and farther, he maintained that farm-yard manure had not so great an effect in increasing the yield of wheat as it had at home. For this reason, many farmers would not put themselves to the trouble of driving it out, as the clover sod seemed perfectly sufficient for raising a good crop. It would appear that the decaying matter which the clover roots and herbage yield is best adapted in this climate for supplying the wheat plants with the food that they require from the soil. But in my opinion the practice of sowing wheat early in America has also the effect of rendering less manure necessary.

Nor do I think that the explanation of the matter is at all difficult, if we bear in mind the peculiarities of the climate of the two countries. In the first place, early sowing in America is rendered necessary in consequence of the severity of the winters, for the plants must be well rooted before the frosts set in. In Scotland, wheat sowing is carried on throughout the winter when it is mild, and if the crop has been too early sown on light land, it becomes too thick, which is not desirable, as it is well known that thick wheat usually dwindles away during our long and cold springs, and yields a small return.

In Canada, on the other hand, the comparatively high temperature of the autumns, pushes forward the wheat plants and produces a thick carpet of vegetation, yet vegetation is entirely suspended during the winter. The extra growth which the wheat plant thereby obtains in the long autumns of Canada is kept in reserve, in the shape of sap-stored roots and leaves, until the spring or rather the summer, for in this Siberian climate there is no spring. Within certain limits, then, the more autumn growth that the wheat gets in Canada, the less need has it of manure in the early summer. In Scotland, we see the application of a similar principle in the growth of turnip seed. Bulbs of late summer and autumn growth are first got, and then the nourishment

contained in the bulbs is drawn upon next season for the development of the flowers and seeds.

More than this, the temperature in Britain is low, and the weather often arid during the early stages of the growth of the wheat plant, conditions that demand a more abundant supply of manure. But in Canada the weather remains cool, and keeps vegetation dead until the first week of May, when summer begins in earnest and incipient vegetation is vivified by great heat and an adequate supply of moisture. When these circumstances are duly considered, we need not wonder at the peculiarities in the systems of wheat culture adopted at home and in the Western World.

One fact connected with wheat culture in America is worthy of being noticed, as it shows the remarkable effect of climate on the plant. In no part of North America which I visited can the common varieties of wheat that are sown in autumn be sown in spring and produce a crop of grain, for they only grow leaves and stems, and do not form ears. Wheat exhibits somewhat similar habits when sown in June on rich land in Scotland. There is a great deal of spring wheat sown in America, called the Black Sea variety, which appeared to be very similar to what is known in this country as April wheat, a red awny variety.

It is further worthy of observation, that it is of much importance in America to have a thick and well tillered plant of wheat in spring. Late tillering produces coarse and vascular stems, which are particularly liable to be attacked by disease. "Sow early to prevent rust and mildew," I heard repeated by the farmers in every part of America. The most of the summer rains in Canada and the United States fall in heavy thunder showers, attended with a high temperature. Such climatic conditions favour rust and mildew, indeed, actually rendering the crops grown on rich land so liable to their ravages that the best soils for wheat in America are those which would be considered inferior ones for the same crop in this country. The further south that I went, the poorer did I find that the soil required to be to produce a healthy crop; and although there is scarcely any winter in Alabama, a well tillered plant seemed to be essential

to obtain a healthy ripening crop of wheat even on very poor lands.

I saw some fine crops of Indian corn on inferior land in Canada, but the treatment had been liberal, and, from all accounts, it is very grateful for tillage and manure. Indian corn is planted in May, and ripens by the middle of September. Buckwheat is also sown in summer, but usually only upon the poorest soils.

At Dunnsville I learned that insurance against fire is as high as 3 per cent on the ordinary wooden stores, but only $\frac{1}{2}$ per cent upon those made of bricks with fire-proof floors. Fires seem to be still as common in Canada and all parts of America as formerly. I was very much amused the day I went up to Geneseo, when we stopped for a few minutes at a small inn to change horses. A rough and unshaven fellow came up and asked the news from one of the passengers. "Nothing particular," said a gentleman who sat near me, "except that the railway company have met an immense loss from a fire at the station, which has destroyed much property besides locomotives." "Oh," said the fellow, "that is some time ago." "Not very long," replied the other, "it is only three days since it happened, but I suppose you were already expecting something upon a much grander scale."

Returned to Paris, and thence in the afternoon to London, fifty-six miles further west, on the Great Western Railway. About three-fourths of the land is still in the natural forest, but the process of clearing making progress wherever it is dry. The soil is a sandy loam, formed from the decomposition of the drift gravels and sands that appear to cover the whole country. It cannot be said to be rich by any means, but a large portion of it is well adapted for the growth of wheat. Oak and hickory forests are rather common, but the beech and maple predominate. Considerable tracts of swamps are also seen, with their peculiar forest growth. The cars were very crowded; more than half of the passengers were standing, a good many of whom, like myself, left the train at London, to attend the exhibition of the Provincial Show of Canada West.

27th September.—This was the chief day of the show, and about 40,000 persons were on the grounds. I was quite surprised to see so many fine specimens of cattle, sheep, horses, and pigs. Of the first class I admired the Short-horned cattle, and their crosses with the common breeds. The Leicester sheep, too, were remarkably good, and numbers changed owners at high prices, as much as from ten to twenty pounds sterling being given for lambs of the best stocks. The rearing of sheep and cattle seems to be occupying fully more attention in Canada West than in the north-western parts of the State of New York. Among the implements that were in great variety, the machines for mowing grass attracted considerable attention, and many parties who had used them spoke favourably of them. Indeed, several of the makers said the demand was greater than could in the meantime be supplied. Two different machines were on the ground for cutting, and at the same time planting, potatoes. A machine for paring apples did its work amazingly well. There was an endless variety of ploughs and scarifiers.

The display of fruit and vegetables was particularly fine, while the apples and peaches were truly splendid. Carrots and parsnips were of large size, the former especially thriving well in Canada. The common yellow and red varieties of mangold-wurtzel gave evidence of the capabilities of the climate for their growth. I was told that there is little tendency in the plants to flower in autumn, as they do in the cold climate of Scotland. There was a large number of pumpkins, which were curious specimens of the vegetable tribe. Four of them shown by one exhibitor weighed severally 180, 150, 148, and 112 lbs. It is surprising how such large and succulent plants can thrive in the torrid summer heats of America, even where the soil is dry and arid. In the New England states, I sometimes observed the ground almost covered with large yellow pumpkins, while the Indian corn was completely withered by the drought. The pumpkin is used for feeding cattle in autumn and early winter, but it does not keep long, and its seeds have an injurious action on the kidneys when cattle are fed long upon them. The samples

of Swedes were not large, but it was too early in the season for them, and they had nearly another month to grow.

Besides the articles which have been enumerated, everything that enters into the domestic economy of the Canadian farmer has a premium awarded to it if the judges think it worthy of one. Numbers of booths were erected over the grounds—in some were pictures, pianos, and needle-work in great variety; in others, dogs, rabbits, and poultry. About £2000 were expended in prizes; of this sum the provincial government gave about one half, and the other half was subscribed by the local societies, of which there are a great number, also partly supported by grants of money from the government.

Nothing can be better calculated to stimulate agricultural improvement than the provincial shows. The best breeds of cattle are brought together, and all who attend have an opportunity of seeing first-class animals, which stirs up emulation. New fruits and vegetables are rapidly diffused and their fitness for the soil ascertained. The best implements are brought together and their efficiency tested. Professor Buckland, the secretary, is quite enthusiastic in the duties of his office, and has great merit in the admirable organisation and success of the society. It is a great pleasure to meet a man so well informed in all that relates to the agriculture of Canada.

The appearance of the Canadian farmers with their wives and daughters was somewhat different from the same class that I saw at Marshfield, near Boston. There was more colour in the faces of the Canadians, but there was much less regularity in the cast of their features, and neither men, nor women especially, were so good looking. The New Englanders had the appearance of having undergone a complete social levelling, they had a certain uniformity in development, and besides, were all dressed much alike. Here many of the farmers were untidy and carelessly dressed, though they were possessed of considerable means! I have no doubt the next generation will be vastly improved in appearance and substantial comforts, if the educational system is kept commensurate with the prosperity which is sure to flow from the resources of this fine district.

London has now about 10,000 inhabitants, and, if I mistake not, its progress will be as rapid for many years to come as that of any other city in Canada. Several elegant streets are building, some of the stores are of an immense size, and one of the finest hotels in Canada was nearly completed at the time of my visit. The soil in the vicinity of the town is of a light sandy loam. It cannot be said to be very fertile, but it is beautifully wooded, and the view from the high bank to the west of the town over the fine forest in the broad vale of the Thames is very commanding. The weather was particularly fine while I was at London; the nights were delightfully warm, and the days not too hot.

I left London on the afternoon of the 28th September and reached Hamilton at night; went on board the steamer for Coburg next morning, which was nearly capsized, owing to the carelessness of the man at the helm allowing the paddle-wheel to run upon the side of the canal that connects the bay at Hamilton with Ontario. By this collision the wheel was greatly damaged. The steamer that left before us was signalled back, and took us on board. The weather became stormy, and the lake being rather rough, I soon experienced a sharp attack from sea-sickness. Reached Coburg late at night. Next morning I hired a buggy and drove six miles to the westward to visit some farms in the neighbourhood. The country is level for a mile or two inland along the shore of the lake, though the soil, I could now see at a glance, was not suited for growing autumn wheat in this climate. It was too soft and black in the colour, wanting that peculiar hardness of quality which is essential here for wheat. Spring wheat, oats, barley, and potatoes are the chief crops. To grow autumn wheat well, the land must be pastured for three or four years to give it the necessary firmness, and then fallowed out and out nearly a whole year before the wheat is sown. Under this system the district cannot be a productive one for wheat, even although spring wheat is always sown after the autumn wheat. The arable farms are rather small, and are better adapted for the dairy than for growing much grain. As I drove out I saw some small fields of good turnips and mangold-wurtzel. From what I learned, the

soil and management are generally much the same for a considerable distance both to the east and west of Coburg. A few miles, however, to the northwards, the Trenton limestone disappears, and the primary rocks with their poor soils occupy the whole country.

If the occupants of the land here are not rapidly making fortunes, they are living in easy and comfortable circumstances, and in the full enjoyment of the blessings of liberty and independence. I was everywhere much pleased to find the Canadians having so warm a sympathy towards the mother country, which is always dignified with the title of "home." They are not a little jealous of their enterprising neighbours, to whom I must confess they stand so far indebted for the superior accommodation which the Yankee boats and hotels afford to all who travel on the lake region.

I made a run in the afternoon by the railway to Rice Lake, about sixteen miles north of Coburg, and found the intervening country poor and little of it in cultivation. This lake derives its name from the large quantities of wild rice that grow in those parts of it where the water is shallow. The stem of the rice is from six to eight feet in length, of which two feet are out of the water, and bears small elongated seeds which are gathered by the Indians, who have settlements along its shores. At this season, immense flocks of ducks and geese frequent the lake, attracted by the rice. The surrounding country is poor and uninteresting, and, except a few clearings upon which the Indians have erected cabins, and raise some crops, the original forest seemed untouched. The frosts having been rather keen for a few nights, the leaves of the dwarf oak were now assuming a dirty purple colour; those of the maple were changing to yellow, while the birch was still quite green. The railway is to cross the lake by a wooden bridge, three miles in length. There were very few passengers in the train, and the want of traffic impressed me unfavourably with the prospects of this line as a pecuniary undertaking. Returned to Coburg just in time for the Kingston steamer.

2d October.—Having been so lately in Toronto and other prosperous towns in the western part of Upper Canada, I was

rather disappointed with the dull and comparatively stationary appearance of Kingston. A few of the streets are good, and the houses are substantially built of blue limestone, but the traffic in some of the wide streets is not sufficient to prevent the grasses from springing up. The appearance of the town would at once lead us to suspect that the agricultural capabilities of the country are more limited to the northwards than they are at Toronto. Labour is better rewarded on a rich soil than on a poor one, and hence the amazing rapidity with which towns rise up in America in all those parts that are moderately fertile. Settlers soon find out what suits them best; and one can judge pretty accurately of the fertility of a district by the state and appearance of its chief importing and exporting town. A coarse clay rests upon the limestone here, and affords better land for grazing than cropping. Very little autumn wheat is sown.

The Trenton limestone occupies only a narrow strip of land here. A few miles to the north the granitic rocks prevail. The limestone is often exposed over considerable areas, or only covered by so thin a crust of mould that nothing grows upon it but a few juniper bushes that send their roots into the crevices of the rocks. In the town of Kingston I saw the surface of the limestone most beautifully polished from the effects of ice or some other agent. About five feet of stiff clay had been lately removed from the surface of the rock to get the limestone quarried, so a considerable portion was newly exposed. The surface was a little inclined, but very even and almost as smooth to the touch as polished marble. The groovings or scratches were from north-east to south-west, and as straight and parallel to each other as if they had been drawn with a ruler. In some of them you might have laid in your finger, while others were as fine as if they had been made with the point of a knife. Afterwards, at Montreal, Sir E. W. Logan gave me an interesting outline of his researches on these perplexing phenomena. He has laid down all the local variations in the directions of their groovings on his geological map of Canada, which he is about to publish at the expense of the government.

After the opportunities I had of becoming fully ac-

quainted with the geological formation of Upper Canada from conversing with Sir E. W. Logan and others, and hearing the accounts of the country from the settlers in various parts, I must confess I was somewhat disappointed to find that the region adapted for wheat raising is comparatively limited. In my agricultural map I have confined the wheat region which lies to the north of Lakes Erie and Ontario, south of a line running from Kingston through Lake Simcoe to Lake Huron. The boundary, I need hardly observe, is not in this instance or in others by any means so well defined as it is represented on the map, being more serrated in reality, though it serves to show the regions that are best suited for certain crops.

The line which I have drawn as the boundary of the wheat region in the Canadas corresponds pretty nearly to that which divides the Trenton limestone from the primary or hypogene rock (granite, gneiss, etc.), which occupies such an immense area in the British possessions. From the accounts that I got, the soil is very poor in the primary rocks, and the face of the country similar to that of the New England States. Squatters may obtain a subsistence in the granite districts, and export some dairy produce, but it is not to be supposed that, in the present circumstances of the country, they can raise more wheat than they require for their own use.

Nor do I think the land which forms the wheat region of Canada West is better adapted for this crop than the average of the land which I have included in the wheat region of the United States south and west of the lakes. Canada West will no doubt produce considerably more wheat in a few years, for large tracts are still waiting for the axe of the backwoodsman to convert them into good wheat lands; and those which are already cleared are capable of producing more abundantly when the mere acts of culture are more skilfully performed, and a rotation of crops adhered to. However, the agricultural capabilities of Canada West will be better seen when they are contrasted with those of Ohio and the North-Western States of the American Union.

CHAPTER IV.

LOWER CANADA.

KINGSTON, *2d October*.—Travellers are often disappointed with the sight of objects of which they may have either heard or read exaggerated accounts, but the St. Lawrence with its “thousand islands” went far beyond my expectations. Immediately below Kingston it is from six to eight miles in breadth, and numbers of steamers and sailing vessels were floating over its dark blue waters, which had more resemblance to an arm of the sea than a freshwater stream. The steamer threads its way among islands with precipitous sides and deep water all around, so that we can approach within a few yards of them. All are covered with broad-leaved timber, the foliage of which is now putting on its bright autumnal tints, and making a particularly gaudy scene. In some parts the river narrows to a mile and a half in breadth, and again swells out into broad lakes, and, as we proceed onwards in our course, we are impressed with the majesty of the mighty stream that forms the outlet to the vast chain of lakes to the westward.

The rapids, too, of the St. Lawrence are a noble and most exciting sight. When I saw the white crests and waves of Niagara rapids above the Falls, I could not believe that the breaking and foaming of the water were consistent with great depth, but this false notion was quickly dispelled as the steamer dashed down the rapids of the St. Lawrence, tossed by huge waves that were worthy of the Atlantic, their crests being broken into white foam where the current was from thirty to forty feet in depth. As it is only a narrow passage through which the steamer has to be steered, consider-

able skill and dexterity are required to avoid the rocky shoals. Four men were at the helm, and the vessel seemed to be completely under control amid the boiling and surging of the current, which has a velocity in some places of fifteen miles an hour.

The country, on either bank of the St. Lawrence, is far from being rich. The Potsdam sandstone, the lowest member of the Silurian series, excludes the Trenton limestone. High mountains are seen in the distance towards the south, and gravels and boulder clay are strewn over an immense area in the low country. In some parts a coarse alluvial clay extends for a considerable distance from the river.

In the steamer I met a farmer who resides twenty-three miles south from Ogdenburg, in the state of New York, who gave the following account of his farm and the country. He was a native of Perthshire, in Scotland, and had emigrated to that part of the country twelve years ago, when he bought a farm of 240 acres at £3 per acre. He has about 100 acres cleared, and very lately refused double the price that he paid for it. All the land worth cultivating has been long occupied in that district, and the most stony land with wood upon it now sells at 20s. per acre. Some of the low land is a strong clay, and the usual practice is to let it lie for three or four years in pasture, when it is ploughed up in autumn and sown in spring with oats or peas. The oat or pea stubble is then ploughed in autumn, and sown with wheat in spring as soon as the weather permits, and usually produces from 18 to 25 bushels to the acre. Winter wheat does not succeed well, owing to its being liable to the attacks of weevil, as well as to be thrown out of the ground by spring frosts. Spring wheat is sometimes sown as late as June, producing good crops that ripen early in August, while the autumn wheat ripens in the last days of July. This farmer complained of the severity of the winters and the quantity of fodder required to keep cattle over that season, and as an instance of this severity, he had crossed the St. Lawrence with his horses on the ice as late as the 15th April. The crops that he raised on his farm this year were 25 acres wheat, 7 peas, 12 oats, $\frac{1}{2}$ potatoes, $\frac{1}{2}$ Indian corn; in winter

he generally keeps 18 cows and 60 sheep. One pair of horses do all the work of the farm. He told me that some of his neighbours take many crops of wheat in succession, and yet obtain very fair returns. This statement is in entire accordance with the opinion I have formed, that the climate of North America permits wheat to be raised on much poorer soils than in Britain, owing to the high temperature of the season in which it grows.

I stopped over the night at Brockville, a thriving little town on the Canadian side, and got another steamer next morning at eight o'clock. A bright and calm morning was succeeded by a cloudy, squally, and rainy day, which caused the lower part of the river to be seen under disadvantageous circumstances. To me, however, this disagreeable weather had some points of great interest, as it was the first time that I had observed a north-east rainy storm in America. Its action was very similar in many respects to the north-east rainy storms of Britain. At 7 A.M. cirrus clouds at a great elevation were moving rapidly from the west with a slight breath of wind from the north. At 8 o'clock, however, a breeze set in from south by east, while a middle stratum of air brought up a thick mass of blue clouds from the south-west. The wind gradually veered round to east, then to north-east, where it remained during the whole day, blowing strong as we landed at Lachine, nine miles from Montreal. The north-east wind was merely a thin stratum of air moving along the earth's surface, and was overlaid by a cloudy stratum moving in an opposite direction. A range of high hills runs south from Lake Francis, and from the shape and form of the clouds that capped their summits, they were evidently under the influence of the south-west middle current. There is, however, the highest probability for believing that the west upper current prevailed over and above the whole as before. There is no doubt that the north-east wind often blows with a clear sky as it does in Britain, but unless meteorological observers analyse the conditions that determine the dry and the rainy characters of the north-east winds, assuredly no great benefits will accrue to science by merely recording their force and frequency, and then making them components

in yearly or monthly averages. The action of the American north-easters will be fully discussed in the latter part of this work.

About Lake Francis, the settlers are chiefly French on the Canadian side, whose farms run back from the river in narrow strips ; consequently, the houses are thickly studded along the river, but are trim and neat-looking in the distance. Got the railway at Lachine, and arrived at Montreal late at night. There are now upwards of 70,000 inhabitants in Montreal, which has all the appearance of a European city. Many of the houses are old but substantial, and none of the streets are regular or have such magnificent stores as are to be seen at Toronto. The fires, too, have been numerous over the town, and the naked walls are standing in many cases just as the devouring element left them several years ago. The majority of the inhabitants are of French extraction, a race who do not amalgamate with the more enterprising Anglo-Saxons. The situation of the town is pleasing, being built on the steep slope that rises from the river, while the hill of Montreal, covered with wood, rises to about 600 feet immediately behind. The St. Lawrence here is about two miles in breadth, and ships and steamers crowd the wharves.

The Victoria Railway Bridge at Montreal is a stupendous undertaking, and it is believed will cost about two millions sterling to complete it. The total length of the bridge is a little less than two English miles. The rails are to be laid in a series of tubes, as at the Menai Straits. The centre span is to be 330 feet, and the others about 100 feet less. The under surface of the tubes to be about 60 feet above the river. At present, commerce is suspended when winter sets in and seals up the river ; but this bridge will connect the Atlantic Railway and the Great Trunk Line of Upper Canada, and thus afford an uninterrupted line of communication from Toronto to the Atlantic towns in the depth of winter. That the bridge and Grand Trunk Line will be of immense benefit to Canada no one can doubt, but whether these great undertakings will ever yield an adequate remuneration to the shareholders is much debated, as the line

traverses an immense extent of poor country. It ought to be borne in mind that the success of the Great Western Railway of Upper Canada is, in a great measure, owing to its forming the nearest route by railway from New York to Chicago and the North-Western States.

That the masses are not so well educated in Montreal is apparent from the scarcity of booksellers' shops in town. The nature of the works, too, lying for sale does not indicate an intelligent and inquiring community. As for public libraries or reading-rooms, where a stranger may spend an hour if the weather is not favourable, you will probably ask a dozen of persons before you will obtain the slightest information where they may be found.

In company with Mr. Evans, secretary to the Bureau of Agriculture, to whom I am under many obligations, I drove out to the country to a sale of farm-stock, about six miles to the north of Montreal. The stock belonged to a gentleman who came from East Lothian many years ago, and as he had imported some improved breeds of sheep and cattle from Britain, he was disposing of the surplus stock. The auctioneer spoke alternately in French and English. From the appearance of those persons who were assembled, it was evident that they were chiefly small farmers, and could not afford to pay high prices for the better kinds of stock, for the same animals would have brought far more money in Upper Canada. Cows of the Ayrshire breed sold from £4 : 10s. to £9 a head, and the sheep from £1 : 10s. to £6 : 10s.

The island of Montreal has been called "the garden of Canada." The soil, however, can only be regarded as of secondary quality. On the farm that I visited, it is a dark-coloured sandy loam. Timothy grass grows well upon it, but the clovers only last one year. The Trenton limestone prevails over the whole island, as an isolated patch among the surrounding primary rocks, rendering the soil genial to the growth of grasses, though not of winter wheat. Oats, barley, and potatoes are the staple crops, with small quantities of turnips and mangold-wurtzel. The carrot seems to thrive as well in this climate as any other green crop. The winters are very severe, so all vegetables must be stored

in cellars to protect them from the intense frosts. The extreme nature of the climate will be sufficiently exhibited by glancing at the accurate observations of the weather of 1854, made near Montreal by Dr. Smallwood, who kindly transmitted me an abstract as below.

	Mean Temperature of Air.	Depth of Snow in Inches.	Depth of Rain in Inches.	Snowing in Hours.	Raining in Hours.	Range of Thermometer.
January	10.92	17.98	1.067	75.55	6.10	78.8
February.....	12.20	23.96	0.150	79.50	2.00	71.7
March	26.84	28.16	0.910	63.25	3.10	60.4
April	37.75	4.03	7.886	5.50	49.10	52.2
May.....	57.17	...	3.418	...	32.00	60.7
June.....	63.80	...	8.384	...	48.50	46.6
July.....	76.20	...	0.174	...	1.50	48.5
August.....	68.31	...	2.265	...	7.45	48.2
September.....	58.01	...	6.167	...	15.16	64.2
October.....	48.40	3.10	4.844	6.10	33.55	55.5
November.....	32.99	1.10	5.130	7.45	29.40	50.6
December.....	7.35	18.67	0.110	44.31	4.30	78.1

Crossed the St. Lawrence, on the 5th October at sunset, with Mr. Yule, who drove me to his residence at Chamblay, a distance of fourteen miles, about nine of which were over the flats of the St. Lawrence, a tract of level land extending for a considerable distance down the south side of the river. The soil consists of a coarse light coloured clay, and the greater part of it appeared to be in timothy grass, which is cut for hay. In the ferry steamer we crossed with about forty small farmers, having horses and carts, who had been to town with hay and other farm produce. The horses were mere ponies; the carts were in proportion, with wooden axles, and they only carried a load of about 800 lbs. Hay is driven to town from a distance of sixteen miles. Indeed, the whole system pursued here involves an enormous waste of labour. The produce of the best soils is 3000 lbs. to the acre, but much of the land is anything but fertile, and will not yield half this quantity. The farm-houses are built along both sides of the road, and are little more than from forty to fifty yards apart, so that they form a continuous village all the way to Chamblay. The farms extend from the road in long narrow strips or ribbons, and were originally ninety acres in extent, having three acres of road frontage.

These in numerous instances have been subdivided among the members of families, by running a fence down the centre. Notwithstanding the miserable system of cultivation that prevails here, it is pleasant to observe that a considerable amount of tidiness and comfort appears about the houses. They are usually of good size, though principally of one storey, with cellars below for storing vegetables in winter. The windows are large, the walls nicely white-washed, and the roofs red-painted, imparting an air of neatness to the whole. The French farmers were as thriving here as in any part of Lower Canada, and seemed to lead an easy and somewhat idle life. The road was a plank one nearly all the way, but I suppose it will be the last of this sort that is made in the district, as the wood is getting scarce and dear. Indeed, a portion of the road is already macadamised.

The country at Chamblay is rather woody, and slightly raised above the flats of the St. Lawrence, which are almost entirely destitute of timber. The Richelieu, flowing from Lake Champlain, descends over its rapids at Chamblay, and might afford an immense power for driving machinery. The surrounding country is very poor, being full of stones and covered with small trees, for the original forest has been cut down long ago. Property is usually divided according to the French fashion. A farm of 300 acres that I looked at was said to be worth £400; it extended back in a long strip into the bush for three miles. As there was little of it in cultivation, to improve it would require an immense labour. Its value must have been chiefly owing to the wood that was on it.

Next day I drove along the south bank of the Richelieu to St. Hilaire through a poor country, consisting of a light coloured clay, not worth more than £2 per acre, even where there are tolerable houses and offices on the farms. Major Campbell has erected an elegant mansion at St. Hilaire, on a situation of great natural beauty. It is built a little south of the river, where the bank has a considerable slope, and about a mile further south the hill of St. Hilaire, finely wooded, rises precipitously to the height of 1300 feet. This mountain forms a somewhat abrupt termination to the primary

rocks which extend into New Brunswick and the New England States. Here also the same classes of rocks have their surface covered with the same mixture of forest trees, consisting of beech, maple, birch, and elm, with a sprinkling of pines. A few spots are occupied entirely by the maple, from which sugar is obtained by boiling the juice collected in spring, when the sap begins to flow.

In the afternoon I walked to the top of the hill, to obtain a view of the surrounding country. The weather was charming, for the south wind had once more brought a delightful temperature, quite in contrast to that of yesterday, when the cold north wind made it very uncomfortable. A beautiful little snake, the second I had seen in America, glided across our path, but, being pursued, it stood half erect and waited our approach, when it was quickly dispatched with a stone.

In ascending the flank of the hill, fine orchards of apple trees were once more observed on the poor granitic gravels, and many of the trees were loaded with fruit. The apple does not thrive on the clay soils of the flats of the St. Lawrence, in consequence, I suppose, of their tenacious nature, while good orchards are met with throughout the island of Montreal, where the soil rests upon the limestone and is more friable.

A complete bird's-eye view is got of an immense stretch of country from the top of the hill of St. Hilaire. The Richelieu in its windings is lined on both banks with farm-houses, which have the appearance of one long straggling village. The country between the Richelieu and the St. Lawrence is flat, and double rows of houses line the roads that intersect the treeless tract; while the long narrow strips of farms, with their wooden fences, look like ridges in the distance. Towards the south the country is mountainous and covered with timber.

The autumn frosts were rapidly changing the colour of the leaves. Indeed, in those parts where they were exposed to the winds they were withered, and many had already dropped off. In looking down into the sheltered hollows, however, where the leaves were only undergoing a mellowing

from the effects of the sun and frosts, the brilliancy of the colours was extraordinary. The tints from deep purple, shading into fresh green and pale yellow, were altogether surpassing belief or description. I was loath to leave so glorious a sight which I had little prospect of ever beholding again.

Major Campbell is a most enthusiastic agriculturist, and is doing a vast deal to promote improved modes of farming among his contented neighbours the French settlers. The present generation are not likely to profit much by his example, nor is it easy to see how their stationary condition can be reached and rendered progressive, unless by educating the rising generation, and instructing them in the principles of agriculture. This course was recommended by the late Professor Johnston, and seems the only hope of effecting a general improvement in this miserably managed country.

The soil, however, it must be confessed, is not naturally good, having too much clay in its composition, and being unsuitable to the growth of grass. About St. Hilaire land sells at from £2 to £2:10s. per acre, and lets at five shillings per acre; its value has increased very little for the last ten years.

Major Campbell's property lies at a higher elevation on the sloping bank, and is not of good quality. He is an advocate for sowing wheat in autumn. His ideas and those of the late Professor Johnston coincide, that it is owing to the land being so much exhausted that the wheat plant is weak and predisposed to the attacks of fly during the flowering season. How far this opinion is correct I cannot say, but I did not see ten acres of autumn wheat in Lower Canada, and it never was grown to any extent. Whatever may be the capabilities of the climate for green crops, I saw few turnips or mangold-wurtzel, and none that could be reckoned good.

7th October.—I Returned to 'Montreal by the railway through a poor country, subdivided in the usual manner, and drove out in the afternoon to St. Martins, Isle of Jesus, a distance of twelve miles. The country is undulating, and the soil often light and gravelly, though of a better description than what I saw in the flats this morning. Many large

boulders are scattered over the arable land, but grasses grow freely, and are still fresh on these limestone soils. The apple orchards are numerous, and relieve the country of the monotonous aspect which prevails in the flats of the St. Lawrence, where scarcely a tree is to be seen. The farmers have in some places clustered together into villages, and go out into the country to cultivate the land as they do in many parts of France. Barley, oats, and a small quantity of spring wheat are the chief crops. Farming is not pursued with any sort of energy.

The very changeable nature of the climate of Canada in autumn may again be noticed. Two days ago the weather was so cold that a thick great-coat was insufficient to make one comfortable when exposed to the north wind; but to-day the south wind, with a bright sun, set up the thermometer to 74° in the shade, and this night is so warm that one might dispense with a coat altogether. The warm and cold periods, or spells as they call them in America, alternate with each other until the middle of November, when the frosts get fully established.

A medical gentleman, who is in extensive practice in the district that I visited to-day, described the peasantry as a peaceable and kindly people, though much under the influence of the priests. They are honest in their dealings, and make it a matter of honour and conscience to pay their debts when it is in their power. The smaller French cottages that I saw in the country in my afternoon's drive were kept very clean and tidy. The glass in the windows was bright and shining. The doors open at once into the rooms, which must I think render the houses cold in winter, unless the joints are very tight. As I drove through the suburbs of Montreal about dark, the cottage doors were all standing wide open, and the children almost naked were rolling about outside.

Among the many pleasant reminiscences which I have of my short sojourn in Canada, I retain a lively recollection of the time that I spent in the company of Mr. W. E. Logan, provincial geologist, who has since been knighted by the Queen for the eminent services that he has rendered to

the cause of science in this colony. The labour and perseverance with which he has pursued his investigations under difficulties of no ordinary character, have at last met with a suitable and well-earned acknowledgment. His intimate acquaintance with the geology and physical features of the country served to correct or confirm the information which I had previously gathered, from various sources, respecting its agricultural capabilities.

On the night of the 9th October I went on board the steamer at Montreal for Quebec, and though the distance is 180 miles, I was landed in the morning, after a passage of twelve hours, during which I had a most comfortable night's rest.

The breadth of alluvial soil along the banks of the St. Lawrence varies much; indeed, for some miles west of Quebec little arable land is seen from the river. The banks are rocky and precipitous, and covered with small timber. A narrow strip of the Silurian formation runs down both banks, and sometimes the limestone is covered by a moderately fertile soil, but in many parts the rocks only present a bare and polished surface. The extent of good land in Canada East is very limited, and has all been settled long ago. No doubt a large area still remains to be appropriated and cleared, yet from its inferior quality there is little prospect of its yielding any grain for export. As in New England dairy produce must afford the chief article for sending to market in exchange for other articles needed by the farmers. Even in the present day, there are a considerable number of French settlers on the poorer lands of Lower Canada who fare very miserably. They usually sell the most of the spring crops soon after harvest, and rely upon gathering sugar from the maple in spring, to afford them the means of buying seed-grain. If the supply of sugar is scanty, as has happened in 1855, they are involved in difficulties, and the land is left unsown. There is great unwillingness among the French settlers to emigrate to the west, where their labour would afford them an amount of the good things of this life that would be luxury itself compared with their present condition. They will rather occupy the most poverty-stricken soils that are only capable of furnishing

a scanty and precarious subsistence, than leave their friends behind.

The sugar that is collected from the maple-tree over Canada and the Northern States of America, amounts to a large quantity in the aggregate. But it is almost entirely consumed in the districts in which it is collected, and both the Canadas import a considerable quantity of sugar from the West India Islands. The sugar is obtained from the trees in April by making incisions in the trunk. The sap being collected in wooden troughs, is boiled down to a certain consistence, after which it crystallizes on cooling. It is commonly used in a rough and unpurified state, and though retaining the peculiar flavour of the maple, is far from being disagreeable. During the collecting season parties go into the woods and camp out for several weeks, when the processes of bleeding the trees and boiling down the sap are jointly carried on. The maple is often seen growing on very barren soils, but its trunk is seldom more than a foot and a half in diameter. A single tree, on an average, yields about one pound of sugar in a season.

At the junction of the St. Charles River with the St. Lawrence, Quebec is built, on the steep slopes and brow of a high and sharp promontory that points down to the Isle of Orleans, where the noble river begins to open out into a baylike breadth. The streets leading from the wharves are narrow and steep, and are at this season all bustle and activity. The St. Lawrence commonly freezes here by the end of November, and business is in a manner suspended until the following May. During the close season the town is deserted by the labouring population, who then find work in the country. In the town and neighbourhood there are many spots of great historical interest, and the view from the fortifications is one of the most picturesque in America.

During the few days that I remained in Quebec, I made some excursions into the country. One day I drove, in company with the well-known traveller, Dr. Kohl of Berlin, to the falls of Montmorency, about six miles down the north bank of the St. Lawrence. The cultivated land, entirely free from wood, rises in a long and easy slope from the river

towards the high grounds, which are covered with birch and pine. Along this slope lay our road, which was almost as thickly lined on both sides with farm-houses as the street of a New England village. The farms run north and south in narrow ribbons. This village-like cluster, I was told, extends about forty miles down the bank of the river.

The soil is comparatively good, and rests upon the Trenton limestone which crops out to the surface in many places. It was covered with as fine a carpet of grasses as any that I had seen in Canada, on land so light. The red clover plants also were retaining a pretty fair hold of the ground, where they had evidently been pastured for several years. Some of the crops of barley and oats were still outstanding.

We went into several of the houses, which are neatly built with wood, and in all got a hearty welcome. One of the largest and newest was sixty feet long by thirty three feet wide, with a cottage roof and attic windows, and a verandah extending the whole length in front. There were three large windows on each side of the door. The interior was divided into two apartments: kitchen and parlour. There seemed to be a great deal more accommodation than was necessary to the circumstances of its occupants, for the rooms appeared empty in consequence of the scarcity of furniture. In fact, these simple and peaceable people seem to have as much vanity in erecting large and stylish-looking houses, in which they have little to put, as many display in other places in decorating their rooms with costly furniture.

The farm buildings belonging to this family were commodious and well contrived, and some taste was displayed in their erection. Part of the farm, which contained 250 acres in all, was unclaimed. The usual produce was 100 to 160 bushels of spring wheat; 50 barley; 400 oats; 50 pease; 600 potatoes; stock, 3 horses and 6 cows. This was one of the largest farms in the neighbourhood, the generality appearing to be very small. Still, on going into the meanest-looking houses, the inmates had the air of being in circumstances far above the reach of want. Dr. Kohl, who is well acquainted with the condition of the French peasantry in those parts of their native land from which the Canadians

emigrated, was pleased with the advancement they had made in this country.

The falls of Montmorenci are well worthy of a visit; the river containing a considerable body of water rushes over a precipice 250 feet in height. Their situation is also fine, for an immense semicircular area has been washed out of the precipitous bank of the St. Lawrence. A large section of the strata is exposed, exhibiting boulders of all sizes. Part of the Montmorenci has been diverted to the westward, and employed in driving machinery for cutting timber. The quantity of wood which is sawn in the course of an hour suffices to give one an idea of the enormous trade in lumber which is carried on in this part of the world.

We returned to Quebec, by way of the Indian village of Lorette. As we left the high road, we passed through a poorer district nearer the hills, where there was much uncleared ground. Numbers of women were lifting potatoes in the fields, and, unless in the Slave States, this was the only instance in which I saw women employed at field operations in America.

The Indians at Lorette have embraced the Catholic faith; and missionaries are stationed amongst them, both to teach the children and dispense the ordinances of religion. We visited the school, where upwards of thirty boys and girls were taught. The boys had more pleasing features than the girls. In all the hair was particularly dark and glossy, and the eyes were small, of a lustrous blackness, imparting an expression of great quickness and untameable wildness. The Indians in the village, however, are completely civilized, have good houses, and are now acquiring habits of cleanliness, and cultivating the land in the same manner as the French settlers.

Our road from Lorette to Quebec lay down the valley of the St. Charles River, in which the pastures were very fine. Throughout our drive to-day we passed numerous tall crosses, which were erected five years ago, when the most of the inhabitants took upon them the vows of the tee-totallers. From various sources I was gratified to learn that they had kept their vows faithfully, and that a vast improvement has since taken place in their moral and physical condition. The weather was

clear to-day, and though a brisk south wind had blown since morning it was exceedingly cold, showing that the north wind of the previous day had swept the country over an immense area towards the south.

The effects of the higher latitude of Quebec are apparent in the leafless state of the ash and the elm, while the other broad-leaved trees will be also quite bare in the course of a week. The climate of this part of Canada, however, notwithstanding its extreme nature, seems as favourable to health as any other part of America, for the inhabitants of Quebec are generally robust, and have comparatively ruddy and fresh complexions.

I visited the Catholic seminary at Quebec, where about 200 pupils were boarded and taught all the branches of education that they choose to learn. The fees, with board, are only £16 per annum. There are, besides another 200 pupils who reside in town, and attend the classes. I found Professor Horan a most hearty and sociable gentleman, enthusiastically interested in agriculture, and the best means of promoting its advancement in Canada. He was hopeful that Canada would be more flourishing when the farmers were instructed in the principles of their art. He caricatured their ignorance, by mentioning that they frequently sold their hay for six dollars a ton, and allowed their cattle to become so low in condition in spring, that they looked upon the tail as a useful appendage for lifting them on their feet, when they could not rise through weakness.

The news of the loss of the "Aretie," one of the Collins' European steamers, with most of her passengers, arrived the last day I was in Quebec. Being long past due, serious apprehensions were entertained of her safety, but her fate now spread a gloom over the city. I was walking with Dr. Kohl when I saw the telegraphic news posted on the wall, and I well recollect his exclamation:—"Oh, well, the City of Manchester was the right vessel after all." The day previous, when driving over the country he gave me an extraordinary account of the disgraceful management on board the "Manchester," during the voyage, and stated that before leaving Liverpool he had hesitated whether he would sail by this

vessel or the "Arctic." His friends in America had urged him strongly to take the latter, but the other sailing a few days sooner, determined his choice.

I had frequent opportunities of conversing with Dr. Hall, geologist to the state of New York, who has devoted considerable attention to the relation of geology to agriculture. He was then preparing a map of the geology of the United States, which he was so good as to show me, and point out the relation between the formations and the agricultural capabilities of the country over which I was soon to travel. The particular nature of the soil, however, in Canada West and the United States depends upon the accumulations of drift that cover so large a portion of the surface. It will one day form an interesting study for geologists to trace the extent of those accumulations, and the sources from which their materials have been derived.

Dr. Hall informed me that there are districts in the neighbourhood of Albany which formerly exported considerable quantities of wheat, but export little now. He admitted, however, that the soil was similar in character to that of the flats of the St. Lawrence, and also to the flat lands along the east shore of Lake Champlain. But none of these soils were really good originally. I have no belief in land becoming permanently exhausted by frequent crops of grain if the soil was naturally good and has not been washed away. There are few or no instances of territories, rich in ancient times, being barren in the present day. A want of security to the peaceful occupation of a country may, indeed, convert it into a wilderness, which state, instead of rendering it barren, restores and husband its native strength. By fertile soils, I mean such as are found resting upon our trap formations in Scotland. There are no soils that I saw in Canada at all to be compared in natural fertility to what may be found in Fife or the Lothians. The best qualities of our Scottish soils, however much they may be temporarily deteriorated by crops of grain and weeds, are cleaned as well as enriched by lying for a few years in pasturage. The coarse clays on the flats of the St. Lawrence do not support so good grasses for pasture as the thin limestone soils in the island of Montreal, and

thus their self-restoring powers are comparatively limited. The vegetable deposit, found on the surface when the land was first cleared, being much wasted, the soil has become less friable and less permeable to the air, and all crops now grow less vigorously. The railway embankments, formed of the light coloured clay of the flats, support little vegetation, and the unploughed banks of the rivers have but a thin covering of poor natural grasses—all indicating that the soil was not fertile originally.

At one time the flats of the St. Lawrence produced a considerable quantity of wheat, but in the present day they produce little. About twenty years ago, the wheat-midge attacked the crops when in flower to such an extent that the farmers found it more profitable to sow oats. This insect also often destroys the wheat crops both in New Brunswick and Nova Scotia, where spring varieties are only sown. The later that wheat is sown in spring, or rather summer, in Nova Scotia, the less liable is it to the attacks of fly. From the 1st to the 5th June is the usual period of sowing, but it is sometimes delayed until the 10th.

Previous to 1834, the common system that the Canadian farmers followed on the flats of the St. Lawrence was to sow wheat every other year on the same land, without any other preparation than ploughing once in autumn and sowing the seed in spring. No artificial grasses were sown for pasturage, and the cattle merely picked up those grasses and weeds that came up naturally. In many parts the same miserable system is still pursued, only oats or barley is substituted for wheat.

It is worth bearing in mind that autumn-sown wheat was never raised with advantage on the clay loams of Lower Canada, Nova Scotia, or New Brunswick. If the crop withstood the frost in spring, it was generally destroyed with rust and mildew in summer. I saw little or no autumn-sown wheat around Coburg or Kingston, in the eastern parts of Canada West, where the clay soils are richer than those of the flats of the St. Lawrence; but in driving over the country from Bytown, on the Ottawa, to Prescott, on the St. Lawrence, wherever the soil was light and sandy,

autumn wheat was the principal crop. The soils of Lower Canada seem to be unsuitable for autumn wheat, and the same class of soils is so, to a greater or less extent, over the most part of North America. Dr. Hall informed me that there were districts in Ohio which would be better fitted for growing wheat after they were cropped for some time with Indian corn. In their present state they were too soft, in consequence of the vegetable matter that they contain, for wheat ripening upon them, without being liable to the attacks of mildew. I had afterwards many opportunities of verifying this opinion in Ohio as well as in other western States. The hot and moist nature of the summer climate of North America renders the autumn varieties of wheat very liable to disease, and particularly so on soils that have any tendency to encourage grossness in the plant. Hence the physical nature of soils has a much greater influence in America on the growth of wheat than it has in our own cool and less foreign climate, in which it can be raised on all varieties, with the exception, perhaps, of peaty soils.

I learned that the wheat soils only occupy a small area in Nova Scotia and New Brunswick, that even on the best farms there is rarely more than one-tenth of the arable land sown with this cereal, and almost every farm has a considerable extent of outfield that is allowed to remain in pasture. There is little prospect, in the meantime, of these provinces being able to supply themselves with wheat.

Lower Canada, New Brunswick, and Nova Scotia, on the whole, have very poor soils. The lumber and mining operations have contributed more to their wealth than their agricultural produce. The immense rafts that are constantly passed when sailing on the St. Lawrence or the Ottawa, show the extent of the lumber trade, and what the country must owe to it. The lumber trade is carried on by capitalists, who send men and horses into the woods in winter. The timber is hewn down and squared on the spot, and then hauled over the snow to the bed of the nearest stream that will afford as much water as float it down in single logs to the river when the snow melts in spring. The men camp out in the woods, and live in huts, which contain about

twenty. One man is engaged as cook, and carries out the victuals to the others when they are at work. The life of the lumber-men is a very exciting one, and leads to roving and unsettled habits. They live in the woods all winter, float down the rivers during the summer on the rafts, which require twenty or thirty persons to manage them, and often fail to reach their destination before the winter again freezes the river.

I had many inducements to prolong my stay at Quebec, and it was with some reluctance that I bade adieu to so many friends, and turned my face, on the night of the 11th October, towards a warmer region. Went by steamer up the Ottawa on the 14th, the fine scenery of which was marred by cold and rainy weather. The water of the Ottawa is muddy, and forms a great contrast to the deep blue of the St. Lawrence. Some good farms and orchards are seen as we enter the Ottawa on the east bank; on the west the country is very rough and full of stones; the limestone, however, sends up sweet grasses wherever there is earth at all. The first ten miles of the Ottawa are full of low islands, thickly wooded; afterwards the east bank becomes rocky and precipitous, and covered with pine, birch, and maple. After a sail of forty miles in the steamer, and a drive of sixteen by coach to L'Orignal, I had not seen a single field on the west bank that could be ranked as medium land, and much of the poorest quality was under the plough.

On the forenoon of the 16th October, Sheriff Treadwell drove me to Caledonia Springs, through a considerable extent of flat and wet clay land bordering on the Ottawa. Its value is only about thirty-five shillings per acre, and the settlers have not the appearance of being in a thriving state. The Caledonia mineral waters were at one time greatly frequented, but now are almost deserted. There are about 800 acres attached to the hotel, and the whole was now offered for £3000—a sum, I thought, too large, as the land was worth little or nothing until taken up by settlers. Weather rainy and cold, with the thermometer near the freezing point. In the afternoon I left by the steamer for Bytown, and found a large number of lumber-

men on board on their way to winter in the woods. It was dark when the steamer reached the landing, and a rush as usual took place to get first over the gangway that was put out to the pier. One poor fellow, with a trunk on his back, was pushed into the water and drowned. The little concern produced by this event was shocking, for no one disturbed himself about the matter until it was too late to render assistance.

Bytown is the head-quarters of the lumber-men, and contains a population of 10,000. It is a dirty and disagreeable place, the streets were almost impassable to foot passengers, the hotels were mean, and the bar-room full of rude drunken fellows. I was informed there were 250 licensed spirit-shops in town. Early in the morning I left, and drove south about forty miles to Bellamy, where I had the railway train to Prescott, on the St. Lawrence.

The country is undulating between Bytown and Prescott, with no mountains in the distance. Many of the rocks that crop out are limestone, but sand forms the chief ingredient of the soils, which are poor and stony, and have often numbers of boulders on the surface. To use a Yankee expression, the exportable produce of this region "don't amount to much." Stopping at a small inn on the roadside for a short time, I had some conversation with a farmer who owned 165 acres, that seemed to be about the average quality in the district. The farm was about a mile and a quarter in length, and the sum he asked for it was £450. I have no doubt, however, he would have taken considerably less, as he was anxious to sell it and go to Wisconsin. His crops this year were—wheat, six acres; Indian corn, four; potatoes, two; and his stock consisted of six cattle and thirty sheep: the latter had just come from the woods to obtain their allowance of salt. On the "meadow" of this farm, the pine stumps were standing as thickly on the ground as the trees stood in the original forest, and there were great numbers of boulders. The soil is too poor in this district for the farmers to make money. But, as already noticed, I saw more autumn sown wheat on the light sandy soils than I had seen anywhere east of Toronto.

Poor as they are, they possess the qualities which fit them for this crop. Wheat being sown early, the plants had tillered greatly, and the fields had the appearance of an English meadow in early summer.

I got on board one of the Yankee steamboats for Rochester at night, and found the accommodation first rate; everything was clean and tidy, which I much esteemed, after having so lately experienced the discomfort of the inns in the backwoods of Canada. A person going on board pays, and is booked for his passage, and then has the key of his bedroom handed to him, where all his impedimenta can be securely locked up. On the morning of the 18th October the weather became very threatening, and soon there was a great swell on Ontario. Most of the passengers were sick, but unless during meals I kept my berth and enjoyed a good sleep after having been travelling constantly for two days.

In the steamer I met a farmer from the north-eastern part of the State of New York, on his way to the far west, with his wife and three children; they were in the cabin, and entered as three full-grown passengers. He had also two horses, two waggons, and a buggy; the distance they were to be carried on water was 1500 miles, yet he only paid sixty-eight dollars as passage-money for the whole, and a fortnight earlier it would have been fifteen dollars less. He complained very much of the pastures and other vegetables being destroyed in the district that he had left by enormous numbers of grasshoppers. The lake boats are not built for rough weather; so our captain lay over the night in the harbour of Oswego. The lake being still rough in the morning, and no appearance of getting up the steam, I determined to proceed by railway.

CHAPTER V.

OSWEGO TO CINCINNATI.

Cincinnati, October 21, 1854.—I left Oswego yesterday morning, and my stages to the westward were, to Rochester, 90 miles; to Buffalo, 60; to Cleveland, 183; Bellefontaine, 140; Cincinnati, by Springfield, 117 miles. I arrived here late at night, after a week's travelling. As a general rule, few trains a day are run upon the American railways, especially in the Western States, where the population is thinly scattered. This is no doubt the most economical system, but as the trains are by no means punctual in arriving at the stated time, passengers are often detained for several hours at those towns where the lines of the different companies join, and thus there is frequently a good deal of time lost.

I travelled one night along the shores of Lake Erie, where all the carriages were so completely packed that many passengers had to stand. There are special trains which convey the European immigrants at lower fares than the ordinary trains, but the Americans do not mingle among these foreigners. The Lake Shore Railway is one of the great lines to the western settlements, and I found myself chiefly surrounded with farmers and their families who had sold out "down east," and had bought land in the west. The English language is spoken with great purity in the Atlantic towns, but some of the young women in the train made use of a ridiculous number of Americanisms, and had so much of the strong nasal twang, that at first one might have supposed that they were caricaturing this comical habit. The Americans are a good natured people, and fond of a joke. A lively merchant that sat beside me threw in a few words now and then to stir up the conversation, which in Scotland

I am sure would have been taken amiss, and considered very forward and impudent, but the young rural beauties to whom they were addressed were never at a loss for a happy and good-humoured rejoinder.

I remained for a night at Bellefontaine, as the train by which I expected to get on to Cincinnati had run off the rails. Several passengers were waiting patiently; none of them complained of the delay, but comforted themselves that they had got on safely, and that a little time lost was not of much consequence. In fact, this was sound philosophy, with which I afterwards often consoled myself in like circumstances. Certainly railway accidents are very common in this part of America, for almost every paper reported some casualty, and this same day I met two persons in the train who had met with serious accidents on two different lines. It is no wonder that the engines often run off the rails, for the roadway is badly kept, and the jolting in the carriages is excessive and most disagreeable when the speed is considerable.

The soil is sandy along the shores of Lake Erie, and not of very good quality. After reaching Cleveland, the railway takes a south-west direction through the State of Ohio. For a few miles south from the town it ascends over a slightly broken country, but it soon becomes very level with immense stretches, which have been cut as straight as an arrow through the forest. After getting six miles out of Cleveland, I did not see a railway cutting fifteen feet in depth as far as Bellefontaine.

For about one hundred miles south of Cleveland, the greater part of the country was under wood. Beech and elm were the principal trees, and their leaves were still on, showing a milder climate than I had left a week ago; but their colours were neither so bright nor so varied as upon the trees of the primary soils at St. Hilaire.

The soil on which the beech principally grows in this part of Ohio is a cream-coloured sandy clay of a close texture. It usually contains little vegetable matter a few inches below its surface; and it cannot be considered rich. The roots of the trees only descended a very short way

into the ground, and seemed to run along near the surface. In all probability, the shallow rooting habits of the beech enable that tree to thrive on those compact soils, which the deeper rooting oak and hickory cannot penetrate in consequence of the air being so much excluded. In some parts, however, the beech was growing where there was a considerable layer of black vegetable matter, or what is called "muck," that has no doubt accumulated from the yearly fall of leaves. This mould was most abundant where the soil was damp, and throughout Canada West and the north-western parts of the State of New York I was always told that the beech is the predominant tree on the soft surface-soils that are rich in vegetable matter, a description of land better adapted for Indian corn than wheat. But so far as I now recollect, the subsoils of the beech forests are generally compact, and not favourable to the roots of trees descending. From these facts, I am inclined to think that it is the nature of the subsoil which, in many instances, determines the growth of particular kinds of trees, that the mucky matter of the beech forests is a subsequent accumulation, and that its presence in quantity depends upon influences that retard its decomposition. The greater portion of the land south from Cleveland, though the beech grows upon it, is not well adapted for Indian corn, for it does not contain much vegetable matter, and therefore green wheat fields were common, having many stumps of trees in them.

At Bellefontaine the character of the land changes, and the oak and hickory are the chief trees in the forest. In some of the railway cuttings, the roots are seen thickly interspersed through the ground to the depth of from two to three feet. The soil upon which the oak and hickory grow is of a dark hazel colour; in fact, very much resembling the colour of the roots of these trees, or of their withered leaves. It appears to have been dyed during the lapse of ages by the decaying roots and leaves of the trees that have grown upon it. Oak and hickory forest covered large areas in Ohio, and where the land is cleared is productive of grass, wheat, and Indian corn. These soils, however, did not strike me as being particularly fertile; they consist either of a light sandy loam resting

upon limestone gravel, or of a friable drift clay, yet they are capable of raising excellent crops of Indian corn, which are often taken for several years in succession.

From the enquiries that I made, I learned that if the oak and hickory forests are cut down or otherwise destroyed, the same trees again spring up and occupy the ground. This also holds when the beech forest is cut down, for the beech again occupies the soil which seems to suit it, but on which the deeper rooted oak does not find the conditions suitable to its growth. It would thus appear there is no rotation of trees in this part of Ohio. I was afterwards informed by Professor Mather, Columbus, Ohio, that there are certain districts in the south-eastern part of the State where the soil is a cold clay and entirely under oaks, but on which pines at one time must have grown, as their resinous knots are found in the oak forests in such quantities that they are collected and used as fuel. I regretted that I did not see this soil upon which this rotation of trees had taken place.

Bellefontaine is a small village, and the accommodation for travellers is by no means first-rate, but everything being clean, there was no cause for complaint. In this little country place the levelling of class distinctions seemed to be complete. One of the boarders in the inn, a polite fellow and fully better dressed than any of our company, I found was a sort of gentleman swine herd, who paid three dollars a week for bed and board. After breakfast I took a walk with him for a mile into the country, to see a lot of 300 pigs, which were enclosed in a field of about three acres in extent. The forest had been lately cut down, and the stumps were standing thickly over the ground; the spot had been selected in consequence of a small stream of water running along one of its sides. A wooden bin stood in the centre containing Indian corn in the cob, which the feeder filled into a basket, and then scattered over the surface of the ground twice a day. The hogs were of good sorts, lazy good tempered looking brutes, and getting into prime condition; their average dead weight would be about 160 pounds. The usual allowance for one hundred pigs is eight bushels of shelled corn a day. It costs about thirty-five cents

(1s. 6d.) a week to feed a pig. I was afterwards introduced to the owner of this herd, a much rougher looking fellow than his help, for his beard was of a week's growth, his face unwashed, and his pants a little tattered. He was a good hearty fellow, however, and put upwards of 20,000 hogs every year through his hands. He buys them from the farmers, feeds with corn, and then exports them to the Atlantic towns.

The fact, however, of this hog merchant buying Indian corn and fattening pigs with it, and at the same time having no regard to the manure, shows that the value of Indian corn in Ohio is still regulated by the price which it is worth for feeding. The manuring of land is not yet appreciated, or rather, perhaps, a man's labour is as yet more valuable in clearing and cultivating land than in collecting and applying manure to it.

The soil is comparatively good in the neighbourhood of Bellefontaine, and rests upon drift gravel and clay. Oak is the principal tree in the forest. The wild grape is growing in great abundance, and throwing its vines over the tops of some of the trees. The frost had scorched the leaves, some of which had already dropped off. The south wind had once more brought a delightful temperature; the thermometer was as high as 60° at sunrise, and the day very warm. The first snow that I saw this season was two days ago, as I travelled south from Oswego, where all the windward sides of the trees had a coating; but the air was so dry and braeing that I had no idea it was so near the freezing point.

South of Bellefontaine the country becomes more rolling and covered with a sharp sandy loam, but in some parts it is too clayey for Indian corn being cultivated with advantage. To the eye of an agriculturist there can be few more pleasing spots in America than the district around West Liberty. The farms are from 200 to 300 acres in extent, and the houses have every air of comfort about them. The fields are of good size and well laid out, and the cattle would not be despised in the best breeding districts in Britain. The principal crops are clover, Indian corn, and wheat; and a short outline of the peculiarities of their culture in Southern Ohio may be here given.

If the physical conditions of the soil determine the kinds of trees which cover a country, the chemical conditions (over and above the mere presence of plant constituents) have much to do with the fitness of soils for the growth of clover and the grasses. The very genial nature of the soil and subsoil in the district around West Liberty, for the growth of clover and grass, is strikingly exhibited on some of the limestone gravels. On the railway embankments, amongst sand and gravel, I noticed plants of red clover which had from forty to fifty stalks from one root, and among the same materials the beautiful Kentucky blue stem grass was growing most luxuriantly. On the arable lands here the clovers were remarkably well planted, while on the clay soils to the north of Bellefontaine the pastures were generally miserable, being overgrown with annual weeds that were now withered, and from two to five feet in height according to the richness of the land. The Kentucky blue grass affords excellent pasture on the more friable loams of Southern Ohio, and when the fields are seeded down with it, the most of the noxious weeds are kept under, and the fertility of the land is soon restored after it has been reduced by cropping. Where wheat and Indian corn lands produce good grasses for pasturing, they may be considered as practically inexhaustible.

It is common in this part of Ohio to allow the land to lie in pasture for several years, and then to sow wheat and Indian corn alternately for a number of years, without any manuring. I first saw this mode of cropping in the neighbourhood of West Liberty. The causes that lead to this change in the system of farming are worthy of being inquired into. Somewhat to the south of Lake Erie, the climate admits of a different variety of Indian corn being cultivated. The kind chiefly grown in Canada and the Northern States is called Flint corn, and is extremely beautiful, its long cobs being filled with large yellow plump grains. It is cultivated in rows, at intervals of thirty to thirty-six inches, and the plants are from a foot and a half to two feet apart in the rows. As already stated, the objection which the farmers in the Northern States and Canada have to the raising of Indian corn, is the great amount of hand labour that is required to

keep the crop clean. But in Southern Ohio, the variety best suited to the climate is the Dent corn, which is not so plump as the Flint; indeed, the grain in the cob has the appearance of having been shrivelled by ripening prematurely. Here, however, and especially in Kentucky, it is the most productive variety, and what is more important still, it requires little hand labour in its cultivation. The habits of the Dent corn admit of its being planted very wide, so that the horse hoe and the plough can be freely used to keep down weeds. This, it appears to me, is the secret of the economical cultivation of Indian corn in Southern Ohio and Kentucky. The Dent corn is planted in squares of three feet, or in what is called "check rows" by the Ohio farmers. This allows the land to be ploughed and horse-hoed both ways, so that great execution is done among the weeds, for all the ground is stirred during the growth of the crop, except a small space around each stalk. The few weeds that escape the plough are readily extirpated by a touch of the hand-hoe.

The Dent variety of Indian corn is cultivated in all those States which export Indian corn or bacon to a great extent, and the "check-row" system of cultivation is universally followed. The farmer that I met at Batavia Station, after all, was not so far wrong when he told me, that a man and a boy would manage fifty acres of Indian corn in Ohio as easily as five acres on the wheat soils of New York State. From twenty to twenty-five acres of Indian corn is the common quantity allotted to a man in Ohio, and he will do all the work required in ten weeks. I have met with some Yankee farmers, who boasted that they could cultivate forty acres of maize on the prairies. In consequence of the finer climate in Southern Ohio it is also highly probable that this crop requires less manure to grow a given number of bushels than it does in the Northern States.

Indian corn is sown throughout the month of May in Southern Ohio, and ripens in the early part of September. Like the turnip, it thrives best in an easy loam, and frequent ploughings during the summer promote its growth, for a well-stirred soil absorbs moisture during the dewy nights. The stronger clay soils are not so well adapted for Indian corn.

for on these it is apt to suffer more when the drought is protracted. Indian corn yields from forty to seventy bushels to the acre, on the sandy loams, in the vicinity of West Liberty.

The natural yield of wheat is not so large in Southern Ohio as in Canada West and the Northern States, but the smaller yield is obtained at less expense. I was quite astonished at the easy way in which wheat is got in the neighbourhood of West Liberty, and I afterwards learned that the same system is followed in all those districts in which the Dent corn is cultivated. The wheat which was sown after the Indian corn was already beautifully green, though not quite so forward as what had been sown after clover, but the crop of Indian corn was still standing in round "shucks," in the field. The corn had been cut, and put up in rows in these shucks, which were about three feet in diameter at the bottom, and tapering to the top, were tied with pieces of the stalks. In this state, the Indian corn is secure from the influence of the weather, and might stand uninjured till spring, as the cob is completely protected by its sheath. In many instances, the fields upon which the Indian corn was thus standing had only got some harrowing to prepare it for the wheat, which had been either drilled or sown broadcast, and again harrowed to cover it, and the stubble of the Indian corn was seen over the fields from six to eight inches in height. By this system, the wheat is got early into the ground in autumn—a condition essential to its successful cultivation throughout America. The Indian corn is removed from the wheat fields in winter, and the small spots of ground upon which the "shucks" stood are sown with spring wheat.

Large herds of fine cattle were grazing on the meadows along the rivers betwixt Bellefontaine and Cincinnati. The railway runs through a portion of the rich Miami valley, where Indian corn is the staple crop. I noticed a few sheds adjoining the farm houses for drying tobacco.

There are now upwards of 160,000 inhabitants in Cincinnati, "the Queen of the West," and the numbers are still rapidly augmenting. The streets are wide, with rows of trees along the side walks, and many of the private dwellings, shops, and hotels, are built in a style of great magnificence. The streets,

however, have been long noted for their filthiness, and are still overrun with hungry pigs that feed upon the offal that is thrown out of doors. These brutes act the part of scavengers, and, belonging to no one, those who choose may catch and kill. The most of them, however, are lean and hungry looking, and do not tempt even the Irishmen who abound in the city to reduce their numbers. Nothing shows more strikingly the absence of an indigent class in the west, than the existence of this herd of stray pigs which infest the streets of Cincinnati.

I was considerably disappointed at the sight of the Ohio. The street by which I approached this river appeared to be a continuation of another in Covington, a town of 20,000 inhabitants on the opposite or Kentucky side; and on first looking across, I had no idea that the Ohio lay betwixt the two; but there it was confined within a narrower bed than usual, in consequence of the long continued drought. It did not seem to be more than 250 yards across, and though it had recently risen two feet, there was scarcely five feet of water in its deepest parts. From the lowness of the water, business had been greatly suspended. The difference betwixt high and low water is about sixty feet, and the houses along the wharf are built about high water mark; thus there was now a great extent of the muddy banks sloping down to the channel left dry, a circumstance which rendered this part of the city by no means prepossessing. The water of the Ohio is muddy, and of a dirty cream colour.

I had no distinct idea of the physical peculiarities of the valley of the Mississippi and its tributaries before visiting Cincinnati. The States of Ohio, Indiana, Illinois, and a large portion of Kentucky, Tennessee, Missouri, Iowa, Wisconsin, Michigan, and Upper Canada, may be regarded as forming a vast plateau from 700 to 900 feet above the level of the sea. As the Ohio river at Cincinnati is 432 feet above the level of the sea, it is therefore about 400 feet below the general level of the vast plateau that forms the surface of the States just mentioned. This table-land nearly corresponds with the regions traced on the map prefixed to this volume as forming the wheat and Indian corn regions

west of the Alleghany range. The Ohio and Mississippi have cut channels for themselves out of this table-land, the strata of which are nearly horizontal, and consist of thin beds of limestone alternating with soft aluminous shales. At Cincinnati the formations belong to the Trenton limestone, a member of the Lower Silurian, the softness of which has favoured the Ohio in excavating a deep channel. The escarpments on the Ohio and on the Kentucky side form steep banks to the river of 400 feet in height. The action of the side streams that flow into the Ohio has further served to cut out the country, from two to four miles on both sides of the river, into an innumerable series of rounded hills and valleys, covered with magnificent forests or fine pastures. Cincinnati lies in a hollow of a semicircular shape, and is sheltered on the north by the steep escarpment of the table-land. To the east of the town the observatory is built on an out-jutting portion of the plateau, which approaches the river more closely than usual.

“In tracing the Ohio to its source,” says Mr. Elliot,* “we must regard the Alleghany river as its proper continuation. This noble tributary rises on the borders of Lake Erie, at an elevation of 1300 feet above the surface of the sea, and nearly 700 feet above the level of the lake. This plain along which the river flows is connected with no mountain range at its northern extremity, but continues its rise with great uniformity from the mouth of the Ohio to the brim of the basin which encloses Lake Erie. The sources of the tributary streams are generally diminutive ponds distributed along the edge of the basin of Lake Erie, but far above its surface, but so slightly separated from it, that they may all be drained with little labour down the steep slopes into that inland sea. From these remote sources, a boat may start with sufficient water within seven miles of Lake Erie, in sight sometimes of the sails which whiten the approach to the harbour of Buffalo, and float securely down the Connewango to the Alleghany, down the Alleghany to the Ohio, and thence uninterruptedly to the Gulf of Mexico. In all this distance of 2400 miles the descent is gentle.”

* Smithsonian Contributions to Knowledge.

The distance in a direct line from the mouth of the Mississippi to the source of the Ohio near Buffalo is about 1250 miles, showing the slope of the country to be, on an average, about a foot in a mile. But the river in its sinuous course runs nearly double the distance. Its fall is greatest in its upper parts, and from Cincinnati to the sea, nearly 1700 miles, the average is scarcely three inches to a mile. By looking to the map it will be seen that the Alleghany river flows through the higher land that forms the terminating slope of the Alleghany mountains. On the other hand, the country due north from Cincinnati is so level, that—as Professor Twit'hell, assistant at the observatory, assured me—there was scarcely a rise of 100 feet from the ground on which the observatory is built to the shore of Lake Erie; while to the west, as far as St. Louis, with the exception of the broken land arising from the denudation of the side streams, it is almost equally level. It is a characteristic feature of the table-land adjoining the large rivers flowing into the Mississippi, that it is everywhere broken into round hills by the action of the side streams.

Nowhere in America was I more struck with the beauty and magnificence of the country than from the brow of the hill upon which the observatory is built. The Ohio itself, a diminutive object, is soon lost sight of behind the broken and steep banks which it has formed in hollowing out its winding bed. The countless number of hills and dells on both sides of the river are covered with a rich carpet of grass, wherever the forest has been cleared. It is on the southern slopes of these hills that the cultivation of the Catawba grape is so rapidly extending for making wine. The distant horizon was everywhere bounded by the natural forest, the leaves of which were fast fading, and the red, yellow, and green tints were changing to the dull brown. The richness of the country, its apparently boundless extent, and the soft beauty of the landscape, lighted up by the setting sun, have served to render the view from the heights of Cincinnati one that is still fresh in my memory.

The few days that I remained in Cincinnati were spent among very agreeable company. I visited Mr. Longworth's

wine vaults, which have become one of the sights of the town. Great credit is due to this gentleman for his perseverance in introducing and promoting the cultivation of the native grape for the making of wine, which is now beginning to compete with the wines of Europe. As I by no means pretend to be a connoisseur, I cannot say how far the sparkling Catawba falls short of good champagne. To my taste it seemed to retain a little of the peculiar flavour which predominates to a disagreeable extent in the wild grape that is so abundant in the woods. The vineyards occupy the southern slopes of the rounded hills on the banks of the river. The soil is a tenacious loam, and is usually trenched two feet before the vines are planted. It only contains a moderate quantity of vegetable mould, which is said to be more abundant on the northern exposures of the hills than on the southern, in consequence of the accumulation being greater where the soil is less directly exposed to the action of the sun's rays.

It was reckoned that there were 1500 acres in Ohio exclusively devoted to grape-growing in 1853, of which 300 to 400 acres are in the vicinity of Cincinnati. On the Kentucky side a considerable quantity of land is likewise devoted to the grape, and its culture is also extending along the banks of the rivers in Illinois, Indiana, and Missouri. Some of the vineyards yield from 7000 to 8000 gallons. The culture of the grape, however, rarely furnishes a profitable investment for capital, if hired labour is wholly employed. The German settlers realize a good income from this source, as their families all assist. A piece of land from fifteen to twenty acres, with a house on it, is given to a German family, on condition that they plant a certain quantity of grapes every year, and pay the proprietor one half of the proceeds of the vineyard.

The rounded hillocks to the north of Cincinnati afford picturesque spots for residences, and many elegant villas and substantial mansions crown these heights. Among others, Mr. Buchanan's may be mentioned as laid out with great taste. Fine orchards of apples occupied the eastern and western slopes of a lengthened ridge running out towards the Ohio, while the vineyard covered the rounded bank in front, and the elegant mansion overlooked the whole.

The apples were fine and particularly large; some of the varieties ripened in June, while others were not yet ready to be gathered. This good clay loam bore the best grass that I had seen in America, with the exception of the Genesee flats.

There is something very fertile in the most of the soils that are formed from the decomposition of calcareous strata. I was informed by many parties that there is a great extent of land resting on the Trenton limestone in Kentucky, which affords the best pastures in the United States. It is rather remarkable that the region which produces the best grasses is also best adapted for Indian corn. Kentucky may be considered as the heart of the grass and maize region. The Dent variety of Indian corn, which is the most productive and most easily cultivated, appears to obtain in that State those conditions which are favourable to its yielding the greatest amount of grain. It is said that no less than 166 bushels of this grain have been raised upon an acre. No doubt the climate determines the productive powers of the maize, for its yield rapidly decreases as we go farther south, even on the richest soils of the Mississippi. But the chemical properties of the limestone soils of Kentucky seem to bestow their grass-producing qualities. Lieut. Maury informed me that the fine grazing lands in Ohio and Kentucky were confined to the limestone moulds, and he attributes their fertility to the power which the calcareous matter has of absorbing and retaining moisture. The elder Weld also, who travelled in America in the end of last century, notices the bad grazing qualities of the land in Virginia, unless upon the limestone. Indeed, the best land in the same latitudes on the Atlantic coast affords very poor pastures. The fertility of all soils that grow good grasses is enduring, for when temporarily exhausted, it is easily renewed and recruited under pasturage.

The forests are magnificent on the Trenton limestone formation of Southern Ohio and Kentucky. Where the soil is somewhat close in its texture, the beech predominates, but where marly and more open, there is a mixture of trees. The tulip-tree, the chestnut, the hickory, the beech, the oak, the elm, the locust, and the maple, grow in social equality, producing noble forests. The under-growth in these forests was cane-break when the country was first settled, but the

leaves of the cane furnished food much relished by cattle, and the cropping of them in summer had the effect of extirpating the cane. As it disappeared, fine grasses took possession of the soil, and afford what is known in Kentucky as "wood pastures." The powerful rays of the American sun render the grasses under trees not only nutritious, but palatable to cattle. I was also told by Lieut. Maury that the trampling of the ground in pasturing it with cattle had the effect of extirpating some kinds of trees in the wood pastures, furnishing an illustration of the influence of the physical conditions of soil in determining the growth of trees.

Cincinnati has increased its manufactures very much of late years. There are several cotton and tobacco factories, and also of cloth and furniture upon a large scale, besides upwards of forty iron foundries with machine shops. The curing of bacon is also carried on to an enormous extent. As the slaying or packing season was just commencing when I left town, the whole country in Southern Ohio seemed to be swarming with pigs, and long trains of trucks filled with them were pouring into the "Porkopolis," where upwards of half a million are slaughtered in the autumn. The pork trade is now a large one in almost every town in the southern part of the State.

When I was in Cincinnati there was a run for gold on several of the banks, and the excitement was great, as three or four had already suspended payment. While a friend went into one to draw some money, I intended to remain on the steps of the door with another gentleman, until he should join us. But one of the clerks of the establishment came and told us to come in, if we required any money, and get it, but not to stand about the door, as one or two might be the means of collecting a crowd, and causing a run upon them. This I thought revealed a deal of weakness, and at once I left the steps as if the walls of the house were about to fall. A few days after leaving town, I learned that all the banks in Cincinnati had suspended payment. During the time I was in Ohio, I met several parties who had been severe sufferers from these failures. Others, again, were rejoicing at the crisis, and blaming the democracy for the disgraceful state of the currency laws.

CHAPTER VI.

CINCINNATI TO CHICAGO.

LEFT Cincinnati, Ohio, on the afternoon of 24th October 1854, for Springfield, eighty miles to the north-east, where the National Agricultural Society held its annual exhibition. The country in the neighbourhood is moderately fertile, and consists for the most part of a sandy loam, dyed into a dark hazel tinge, which is peculiar to all those soils upon which oak and hickory are the predominating trees in the forests. The subsoil is usually gravelly, though often containing clay. Indian corn and wheat are the principal crops which are cultivated. The land is suitable to the growth of clovers, and produces good pastures when seeded with those grasses that are natural to the land.

Springfield contains a population of 7000 inhabitants, and is in a very flourishing condition. Agriculturists were attending this meeting from all parts of the Union. The secretary had travelled from Boston, a distance of nine hundred miles, by railway; other officials had come almost as far from the south and from the west, and even some of the judges from Canada. The greater number, however, were from the neighbouring states of Kentucky, Indiana, Illinois, and Michigan.

There was nothing shown but cattle, and the great majority were Short-horns, for which the soil and climate of Southern Ohio and Kentucky seem admirably adapted. I was surprised at the general excellence of the stock; indeed, among the hundred and fifty Short-horns that were exhibited, there were few animals that could be considered second-rate. I am not sure if the Short-horned stock was so uniformly good at Windsor in 1851, though there might be some better animals. One bull had been lately imported from England,

and had cost the owner six thousand dollars. The animals were kept beautifully clean, for great care was bestowed in having them properly groomed. Shortly before a fine ox was led into the ring, I saw three negroes rubbing him down most vigorously with their hands, to put the last polish upon his sleek skin. From the appearance of the animals on the show-ground, as well as of the large herds that I saw in the meadows in Southern Ohio, I am led to believe that the soil and climate are well fitted for maintaining the shape and qualities for which this breed is distinguished. Here there is no evidence that it is deteriorating; though the extent of land capable of yielding fine pasture is comparatively restricted in Canada and the United States.

During the few days that I remained at Springfield, I had many opportunities of conversing with the farmers from Kentucky, and obtaining a knowledge of their systems of husbandry. Kentucky is a slave state, and the size of the farms on the best lands is larger than in Ohio. In the best grazing districts the average being from 300 to 400 acres, though frequently they are as large as 1000. There is not much variation in the mode of cropping. One gentleman whom I met possessed 360 acres, of which 100 were under thinly timbered woods that afforded excellent pasture. The 260 acres of arable land were allowed to remain for six years under grass, then, after being cropped for another six years with wheat or Indian corn, were sown out again for pasturing. Six hands were required to manage this extent and attend to the stock, and eight horses were required for cultivating it.

I was informed that a field, after it had been cropped with Indian corn for eight years, would fill up in four years with the fine blue grass which is so valuable for pasture in Kentucky, although no seeds were sown. So natural is this grass to the soil, that at the end of this period it would extirpate all the weeds that infest the cultivated fields. But by sowing grass-seeds with the last grain-crop, fine pasture would be got the succeeding year. The Kentucky limestone soils, that are so genial to the growth of the finer grasses, are, comparatively speaking, like the same class of soils in Ireland, inexhaustible.

Rearing mules for the southern markets is carried on to a great extent in Kentucky and Tennessee. The gentleman who occupied the farm above described usually grazed forty of these animals during summer. In winter it costs 16s. 8d. (four dollars) a month for keeping a mule, which is allowed as much Indian corn or oats as it can consume. An ox on grass is kept for one dollar a month. Though often the cold is so intense that the Ohio is frozen over in winter, the cattle are not stabled; the wood-pastures affording good shelter from the high winds. They are fed upon hay and Indian corn: the latter being given to them as it is cut from the fields. One would be very apt to suppose that great loss would arise from the imperfect manner in which cattle would masticate the unground grain of Indian corn; but a lot of pigs are usually wintered with the cattle, and act in the character of a save-all. Some of the pasture-fields, too, are often allowed to grow after the middle of July, and thus afford good winter grazing.

That the natural produce of wheat is much smaller in the fine grazing lands in Kentucky than in the country immediately to the south and north of Lakes Erie and Ontario, was the testimony of all the farmers with whom I conversed. The same lands which yield on an average 75 bushels of Indian corn, would not yield more than 18 bushels of wheat. In Southern Ohio and Kentucky, those conditions of climate prevail which are favourable to producing the maximum yield of Indian corn, but which are not equally well suited for large crops of wheat.

Clover and timothy succeed well in Kentucky, and the latter is in great repute for hay. When the land is allowed to remain in pasture, the blue-stem grass occupies the ground and puts all the others out. Large quantities of hay are made in the western parts of the State, pressed into bales, and sent down the Mississippi to New Orleans; for this is a scarce and high-priced article in all the States south of Tennessee.

I could soon readily distinguish the Kentuckians from the northern farmers. Some of the former that I saw here were noble specimens of humanity. Exemption from severe manual labour for several generations, it would seem, has not

been without its influence on the Anglo-Saxon constitution. All that the Kentuckian usually wants is the fine fresh and ruddy complexion to make him every inch an English country gentleman. Had Buffon seen the produce of Kentucky at the exhibition at Springfield, he would have qualified his theory of the degenerating influences of the climate of North America upon men and animals. The northern farmers, on the other hand, are much smaller men, with a vast amount of activity and energy. All who labour with their hands upon the land in America lose that full habit of body which our agricultural labourers have at home. A difference in the dietary may have something to do with the matter, but the great extremes of the climate, conjoined with field-work, are the principal elements. It struck me that both the men and women among the wealthy commercial classes in the Northern States were more robust than among the agricultural.

The ground is seldom manured for crops of any kind in Kentucky or Ohio. As yet labour appears to be worth more when applied in cultivating a larger area of land than in collecting and applying manure to a smaller one. However, as the most of the stock is fed out of doors, there is little manure made about the yards. The principal maize-producing districts in Ohio are along the margins of the Scioto and Miami rivers, which are too rich for wheat. General Bierce, in his address to the agriculturists assembled at the country fair at Medina, said that "sandy land is preferable for wheat over clay soils." This sounds rather curiously to a Scotch farmer. The General gave a chemical reason for it, which I need not repeat; but the circumstance shows how much climate may alter our ideas respecting the characters of the soils which are best suited to certain crops.

A large marquee was erected within the grounds to accommodate one thousand persons at the banquet which terminated the proceedings, and about this number of ladies and gentlemen sat down to a cold luncheon. Before the guests entered, they marched in procession around the grounds, headed by a band of music. Both ends of the erection were only closed to the height of four feet from the ground. The sides also had an open space all round, so that any one on

the outside could easily see and hear what was going on within, if he chose to approach; and very soon the external company became larger than the internal. After dinner all were put upon a footing of equality. Several of the speakers addressed themselves quite as much to those who were outside as to the guests proper. It was not to be expected that the topics discussed at such a meeting would be confined to agriculture. A short speech from the president on the success of the national show of stock, seemed to absolve those who followed from all allusion to the subject—for each speaker launched out on his own particular hobby. There was one flowery and really eloquent speech by a Kentuckian, in which he took occasion to deprecate the “fanatical agitation” of the Northern States against the “domestic institution.” Some followed on the other side, and spoke with as much vehemence. A governor of one of the neighbouring States, mounting on the form and turning round, chiefly addressed himself to those without, on the necessity of keeping the able men at home to manage local affairs, and sending all the “blockheads” to Washington. This was a very ridiculous and inflated speech, and I was rather surprised to find its author, whom I afterwards met, a shrewd, sensible, and practical man. A speech on the importance of protection to native industry called forth one, on the Reciprocity Treaty, by a Canadian, which, for wit and humour, with all the ornaments of the stump-orator, put the other speakers entirely into the shade. The crowd without were remarkably well dressed. One, who was close at my back, made the remark to his companion that a certain speaker, whose volubility was extraordinary, “would be hard to get down.” The entertainment broke up about sunset, all seeming highly pleased with themselves and each other, notwithstanding the exciting nature of some of the speeches.

Several of the orators who had not got their breath fully exhausted at the banquet, addressed the crowd from the windows of the hotel in the evening, on various political subjects. The curious thing to me was, that men who were really sensible in private conversation, should launch out in such a strain of exaggeration in their speeches; for the most

of those with whom I talked over the matter, looked upon the whole as a piece of foolish acting. It would seem, however, that this style is best calculated to gain the ear of the majority in the western parts of the United States. No wonder, then, that the more rational and enlightened use great efforts to educate the masses.

A few of the spirited inhabitants of Springfield had guaranteed the premiums offered by the National Society. They expected to get out of this transaction by the money drawn for admission to the show-grounds; but the State fair had been held about a fortnight previous in a neighbouring town, when far greater attractions were held out to the general public than seeing well-bred cattle; for, besides the premiums that were offered for all kinds of agricultural implements and produce, some were also given to ladies who could ride and manage horses most gracefully. This novelty was the means of attracting immense crowds from all parts of the State. So no wonder the Springfield cattle exhibition was unpopular; and the receipts fell so far short of the expenditure, as to leave the managers to pay £1200 out of their own pockets.

I lodged in a boarding-house at Springfield that was under the direction of a gentleman and his two sisters. Several of the apartments were newly erected and in an unfinished state. It was overcrowded, and the guests soon saw that the staff of helps on this occasion was far short of the required number; so every one had to *help* himself to many things, and even to clean his own boots. I was well pleased with the article which rendered this operation almost as gentlemanly a one as the brushing of a coat. A long-handled brush, with a smaller round one on its upper side for applying the blacking, enabled any one to put a good polish on his boots with little trouble, and without taking them off. The landlord went about at his ease after serving us at the different meals, but his hands were otherwise pretty full, for he was likewise a banker and an editor of a newspaper.

The weather was most delightful all the time I was at Springfield, being what is called the "Indian summer."

The mornings were cool, with fog on the low grounds, but during the day the sky was without a cloud. The heat was considerable in the afternoons, the thermometer rising to 66°. An almost complete stillness prevailed during the day, indeed there was scarcely as much air stirring as to rustle the rapidly fading leaves in the oak grove where the show was held.

Left Springfield on the forenoon of the 27th for Sandusky, on Lake Erie, a distance of 134 miles. A level but slightly undulating country all the way, part of which was cropped with wheat and Indian corn alternately; though near Sandusky, wheat and clover, as in Canada West, is the common rotation. Two thirds of the country through which we passed was forest, consisting principally of oak and beech, which still retained their leaves; but the colours were fading fast. The immediate vicinity of Sandusky is flat and marshy; but to the south of the town, the limestone gravels and sands afford productive wheat soils.

The population of Sandusky is about 12,000, of whom one-half are of German extraction. The formation here is limestone, belonging to the Upper Silurian. It is covered in the neighbourhood of the lake with several feet of a peaty material, which, on being removed, exposes a surface beautifully smoothed and polished by the action of those agents that have transported southwards the vast accumulations of sand and gravel which lie scattered over certain regions of Ohio. This finely polished surface makes good floors to the cellars of the houses in Sandusky. A travelling companion sought out a friend in town, by whom we were treated to quail, woodcock, black bass, and white fish for supper, which were all particularly excellent. These kinds of fish swarm in the lake, and are caught in great numbers.

Took the steamer at night for Detroit, a distance of seventy miles, and at daylight found ourselves along the wharf of this great depôt of western produce. On the opposite or Canadian side is the town of Windsor, the terminus of the Great Western Railway, that traverses Upper Canada from Niagara by Hamilton. The Michigan Central Railway connects Detroit with Chicago. Hundreds of emigrants pass Detroit every day

in summer for the west, and large numbers are constantly seen lingering about the station waiting for the departure of trains. In general they have a most emaciated appearance; and no wonder, after having suffered a long sea-voyage and great discomfort since landing. The piles of trunks and luggage of all sorts lying about on the wharf gave me some idea of the vast human stream flowing to the westward. The railway company have a river frontage of half a mile, which was entirely covered with goods of one description or other. The river here is three-fourths of a mile in breadth, and flows at the rate of three miles an hour. It is of a fine green colour, as clear as crystal, and used for drinking without filtering.

Detroit has upwards of 40,000 inhabitants. The houses are mostly built of brick, and the streets are wide and handsome. The number of fine villas in the suburbs, as well as the numerous handsome carriages rolling about in the evenings, indicate a population rapidly advancing in wealth and luxury. Three Presbyterian churches were in course of erection, one at a cost of 60,000 dollars, and another at 40,000. From the appearance of the streets on Sunday they seem a more church-going people than the inhabitants of Cincinnati. In the afternoon, however, I met several persons coming into town carrying large quantities of game.

Michigan is by no means so fertile as Ohio, though it contains a large extent of land capable of raising winter wheat. Its surface is very flat, little of it being more than 150 feet above the level of the lakes which surround it on three sides. It forms a part of that vast plateau which is drained by the Ohio and Mississippi, and which stretches through the southern parts of Canada West. Indeed, the soil in Southern Michigan is similar in character to the wheat soils of Canada West; I should say, however, rather lighter in general. The soil of northern Michigan being stiff and cold, does not induce emigrants to settle upon it. A large extent of land along the shores of Lake Huron is very swampy; and wherever dampness exists, there is more accumulation of vegetable matter, which requires to be somewhat wasted by cropping before wheat can be raised upon it, even after the land is drained;

for, until the virgin richness of the soil is in some measure rubbed off, autumn wheat generally suffers from over-luxuriance, rust, and mildew. I have no doubt that much of Michigan, as well as Ohio, will produce better crops of wheat after the fertility of the soil is somewhat reduced by cropping with Indian corn, oats, or barley.

In company with Mr. Holmes, secretary of Michigan State Agricultural Society, I left Detroit by the railway on the 30th October for Ypsilanti, twenty-seven miles due west. The banks of the Detroit were originally settled by the French, and, as in Lower Canada, the farms consist of long narrow ribbon-like strips which extend from the river. The French mode of settlement is not perpetuating itself in Michigan, for their descendants are amalgamating with the Americans. The country to the westward of Detroit is flat, and in need of draining; but it is well timbered, and clearings were taking place rapidly along the line of railway. At Ypsilanti the country is more rolling, and generally sandy and gravelly.

The State Normal School is at Ypsilanti. There were 325 students from ten to thirty years of age—male and female in about equal numbers. The course of instruction is very complete; and every branch, from grammar to algebra, is taught by lectures. The algebra scholars were getting a thorough grounding;—not only had they to give the rule, but the reason for the rule, as they worked out the propositions on the black board. The students were the sons and daughters of the poorer class of farmers. They only paid six dollars each of fees for the winter session; and during summer they either taught in the country or worked at some trade. It is chiefly from the families of the small farmers that teachers can be obtained, as the sons of those in better circumstances go into business. The students had fine open English faces; and Dr. Welch, the Principal, remarked to me, it was wonderful how a little brushing up, through teaching, improved them in this respect. The Americans, in general, make it a point to keep their faces clean, and to have their hair well dressed. And when these are attended to, shabby garments are considerably relieved of their meanness.

There is no statutory obligation to have any religious exercise in this establishment, but a chapter of the Bible is read and a prayer offered up by the Principal before the lessons of the day begin. I was informed by him that it would be considered a very loose establishment if there were no religious exercises. A serious and church-going community can perhaps afford to have further religious instruction communicated by those who are specially set aside for this duty. The prevalence of the religious feeling among the educated classes reacts on the educational establishments; and, from all I learned during my tour in America, I believe that the effect of the present system of education is to imbue the ignorant masses that cross the Atlantic with a reverence for morality and things sacred. One has only to make himself acquainted with the state of some of those towns on Lake Ontario that were visited by Dr. Dwight many years ago, and to compare his descriptions of the manners and morals which then prevailed with those existing at the present day, to be convinced that enlightenment is steadily progressing westwards, and gradually overtaking a ruder and rougher state of society.

Mr. Uhl, a most intelligent agriculturist, who resides in the neighbourhood of Ypsilanti, drove us out in his waggon to his farm, about three miles from town. His land was once thinly covered with oaks, having the scrub or dwarf oak as undergrowth. This kind of natural forest is called "oak opening." The soil was similar to what I had seen in the district surrounding Paris, in Upper Canada. More Indian corn is cultivated than I saw in any part of Upper Canada. The Dent variety of Southern Ohio ripens here, which would seem to indicate that the summer climate is warmer than in the same latitude to the eastward. The eight-rowed white variety, however, is cultivated more generally.

The soil consists of a light sand, which seemed to contain so small a percentage of vegetable matter, that I thought it might do to mix with lime to make mortar. There is little difference in the colour of the soil and of the subsoil. And I was surprised when Mr. Uhl assured me, that as good wheat and potatoes would be raised upon what was brought up twenty feet below the surface as on

the surface-soil itself. If he ploughs deep, he considers that there is no occasion for applying any extraneous manure, save a little gypsum, for the clover or the Indian corn. The condition of this farm, when contrasted with those adjoining, served to confirm the opinion I had already formed, that the wheat soils of America stand less in need of manure than of good cultivation, and a rotation of crops of not too exhausting a character. The young layers of red clover on this farm were beautiful, even the plants in those fields which had been pastured for two years were thick and vigorous. The rotation which he prefers is three years in clover, followed by Indian corn, and then wheat. Amongst the latter, clover is again sown. Wheat, however, is generally sown after clover in this part of Michigan. As in other parts of the Northern States, wheat is sown early in September; the long autumns causing a considerable growth before the frosts of winter set in with severity. Some of the fields of wheat had a remarkably healthy appearance: the colour was of the darkest green, and the plants were matted over the ground. For the first time, however, I noticed here the depredations of the Hessian fly, its larvæ rendering the edges of some of the fields of a rusty red colour.

Mr. Uhl farmed at one time in the Genesee district, New York State, and follows the Genesee mode of farming to a certain extent. The clover fields, when they are to be seeded with wheat, are broken up from the 1st May to the 1st of July—a furrow from eight to nine inches in depth being given. The surface is then cultivated by the grubber until all the weeds are killed, and the wheat is sown broadcast from the 10th to 20th September. Indian corn is planted in squares, or check-rows, three feet apart, which system allows the land to be completely worked by the plough, so that little hand-hoeing is required. Potatoes are also planted in squares, or check-rows—a practice common to all the Western States, for the same reason. The climate of North America causes the potato to produce many more long and slender stems than that of Britain; and when earthed up at the roots by the plough, little hand-weeding is required. Thus it is seen the presiding genius of American farming directs her

votaries towards the economising of manual labour in every department of the art.

Mr. Uhl is a great advocate for grazing more, and having less in cultivation; and no doubt the great rise which has taken place in the price of butcher-meat will have a tendency to alter the modes of farming that are pursued in many districts. The cattle were good specimens of the Durham breed. Sheep are not favourites, because they are considered to eat the clovers too close, and the land does not improve so rapidly as when it is grazed with cattle. There were 55 acres sown with wheat, and 20 in Indian corn. All the labour on the farm is performed with the assistance of two servants and five work-horses. Some of his neighbours were sowing a larger proportion of their land with wheat. One farm, of 110 acres, not all arable, was pointed out where the land is very light, but on which 70 acres were sown with wheat, and on some of the fields several crops had been taken in succession.

Under good management, thirty bushels of wheat are sometimes got to the acre over the farm; but the average produce in Michigan is not one-half of this quantity. This year Indian corn had yielded Mr. Uhl seventy bushels per acre. He sometimes sows it broadcast, and obtains about four tons of hay to the acre by cutting it in a green state. Gypsum is attended with beneficial effects when applied to Indian corn, potatoes, or clover.

Next day we drove on to Ann Arbor, a distance of ten miles, through an undulating country. The soil was light, and principally under wheat, which was very forward, though in some cases sickly, from the attacks of the Hessian fly. The Michigan University is at this town, where the more advanced branches of education are taught free to all. A large library and a museum of natural history are forming. An observatory is also erected in the midst of a stump-covered country, where stately trees had lately grown. In every township in Michigan a certain quantity of land is reserved for educational purposes, which affords the means of erecting and endowing free schools. There is no fear of over-educating a nation; for although education may be free to all, the capacity of a people to receive

it depends upon the length of time during which the parents are able to support their children at school.

Left Ann Arbor in the afternoon, and reached Kalamazoo, a distance of 100 miles. This is a small town, of 4000 inhabitants, which has lately sprung up in the wilderness. The numbers of people travelling on business to different parts of the country were extraordinary. In the hotel next morning I found myself seated at the breakfast-table beside a backwoodsman, with his wife and family. They had all a somewhat melancholy cast of countenance, and seemed to be regardless of the stir that was going on around them. The husband, about fifty years of age, was wiry, but not robust. He told me that he had felled and cleared, in different parts of the country, upwards of 100 acres of heavily-timbered land, and had only got assistance at "log-rolling." As a pioneer in the desert, he spoke with great enthusiasm about his occupation, which, he said, "was hard, but very pretty work." In travelling over America one is surprised to find so large an extent of land cleared; but a few thousands of such men are certainly well calculated to change the whole aspect of a wide country, since every stroke of the axe tells.

Drove out ten miles to the southward with Mr. Holmes, to pay a visit to the president of the State Agricultural Society, who farms in Prairie Rond, one of several little round prairies which stretch along the southern borders of Michigan. The small prairies in this State indicate that there is something peculiar either in the soil or climate which is unfavourable to the growth of wood. These peculiarities are still more fully exhibited to the westward, where an immense area of prairie land exists. The physical causes contributing to the formation of prairies have been much discussed. I shall hereafter give my reasons for supposing that the chief element that has operated in producing those treeless regions is climate.

The road over which we drove was a plank one, through a thinly-timbered oak forest, growing upon sand or limestone gravel. The boundaries of Prairie Rond were as well defined as if it had been the bed of an ancient lake. It

is about five miles in diameter, and almost as level as a bowling-green, though rather higher in the centre, which has made it quite dry. The upper stratum of vegetable mould is about sixteen inches in depth, and consists of a dark-coloured sandy loam; the subsoil of a lighter coloured loam, resting upon gravel or clay. This kind of soil, being apparently rich in those earthy and alkaline matters which plants require, seems to be well-nigh inexhaustible. Crops of Indian corn, wheat, and oats, are raised for many years in succession, without any manure being applied; but the soil gets loose when constantly kept under tillage.

The president's farm is 160 acres in extent, and two young men performed all the labour. On this he cultivates 60 acres of wheat, and 60 of Indian corn every year. These crops are often taken alternately for a number of years. A peculiarity in the mode of raising Indian corn was seen on this farm, which admits of the land being thoroughly cultivated by the plough in summer. It was planted in rows, at intervals of 8 feet, and the distance between the plants in the rows from 6 to 8 inches. Wheat can be sown early in autumn, and grubbed or harrowed in long before the Indian corn is harvested. In fact, while I was there, though the wheat was matted over the ground, I saw a waggon drawn by a horse betwixt the rows of corn, and a man on each side pulling off the ears, and throwing them into it. The stalks of Indian corn were left standing as before, and would remain till spring, affording some protection to the wheat-plant against the high winds that sweep across this country in winter. Even where Indian corn was cultivated in three-foot rows or squares, wheat was growing among the withered stalks from which the grain had been gathered. Thus, although wages are high, and the crops of winter wheat do not average more than 14 to 16 bushels to the acre, yet they are raised at comparatively little expense in alternation with maize, which yields from 45 to 70 bushels.

The young layers of red clover were thick and vigorous. When a field is seeded for grass, it is allowed to remain for two or three years, which serves to solidify the soil, and render it better adapted for winter wheat. Around some of the fields

the finer pasture-grasses were growing luxuriantly, and producing a fine herbage.

The president was from home ; but his daughter, a pretty and intelligent girl, acted as hostess. As all rise early in America, dinner is usually served up about noon. The Americans are commonly good cooks ; and great mechanical skill has been displayed in adapting the kitchen stoves for cooking. I do not think our fair hostess had any help to prepare our excellent dinner, with its great variety of dessert ; but things went on so smoothly that one could hardly believe that both the cook and the lady were combined in her person. After having had some good music and native airs from our entertainer, Mr. Holmes and I found our way in the dark to Kalamazoo, highly pleased with our visit to Prairie Rond.

After bidding adieu to Mr. Holmes, to whom I feel myself under great obligations for his attention, I left next afternoon by railway for Chicago on Lake Michigan, a distance of 140 miles. The line runs through a long stretch of "oak openings," which were the finest specimens of this peculiar kind of forest growth that I saw ; and what made them more interesting was the circumstance of their being almost untouched by the axe of the backwoodsman. Where oak-openings occur, the soil is dry and gravelly, and the surface undulating—a feature which seems common to most of the gravels in Europe and America. The trees are thinly distributed over the surface, and the distance at which they grow from each other seemed so regular, that one might have supposed a skilful forester had been employed to plant them. The crooked trunks are usually about a foot and a half in diameter, and bare from 20 to 25 feet from the ground ; after that they are forked, but having no great abundance of branches, have altogether a gnarled appearance. The soil seems to be too dry and gravelly to support a denser growth ; for on the ridges they were from 30 to 40 yards apart, while in the hollows, where the land was moister, the trees were more thickly planted. The contrast is very striking between the densely-wooded sands and gravels of New England, which are the very types of sterility, and the stunted growth of the trees on the

better soils of the oak-openings. The climate of the Western States is not nearly so propitious to the growth of trees as that of the Atlantic sea-board, where the rains at certain seasons of the year are more abundant.

Oak-openings, I believe, do not occur much farther to the eastward than Paris in Upper Canada, where the soil is somewhat similar to that of the oak-openings of Michigan. It is generally supposed that the prairies and oak-openings are the result of the Indians formerly having fired the country every year for hunting-grounds. The blackened mould of the prairies is no doubt partly owing to the charred vegetable matter from fires which so frequently ran over them. But in the oak-openings there is little evidence of fire being concerned in their formation, for the colour of the vegetable mould is of the same hazel tinge which prevails in the oak-forests of Ohio. These gravelly soils, it would appear, can only support a limited number of trees, and the waste of vegetable matter from decay has always been about equal to the annual growth; so there is no accumulation. I have no doubt that soils of similar quality to those in Michigan would produce dense forests in Vermont. It is worthy of notice that the deficiency of rains occurs principally in winter, which appears to be the most marked peculiarity of the climate of the North-Western States. The following figures, taken from the reduction of observations by the Smithsonian Institution, may help to throw some light on this subject:—

Fall of rain at Gardner, in the State of Maine—average of sixteen years.

Spring.	Summer.	Autumn.	Winter.
10.6 inches.	10.3	10.5	10.1

Fall at Fort Snelling, Minnesota Territory—fifteen years.

Spring.	Summer.	Autumn.	Winter.
6.8 inches.	10.2	5.7	2.0

The North-Western States are also more liable to protracted periods of drought, which Dr. Henry suggested to me might originally have destroyed the forests with the assistance of fires; and when grasses and various plants had once got possession of the land, they would prevent the seeds of the forest-trees springing up. The best prairie lands, so far as

I could judge, had an inctuous clay in the subsoil, and such is, no doubt, most conducive to the growth of grasses. On the other hand, in the great western prairies there are usually stunted oaks, with the scrub oak as undergrowth, of the same character as in the oak-openings, growing upon all the gravelly eminenees which are not favourable to the growth of the grasses. One generation of trees after another maintain their hold upon these knolls, which appear like islands rising out of the wide grassy wastes. On the prairie knolls, as in the oak-openings, there is no great accuumulation of vegetable matter from the growth of timber; but where the soil is more propitious to the growth of grasses, an immense accumulation has taken place. I have often wondered at the enormous depth of mould even on some of the tops of the rounded wave-like eminences that prevail in the prairie region.

The Swedish traveller Kalm relates that the prairies were, even in his time, less productive of pasturage, in consequence of the cattle having extirpated all the best grasses, which he tells us were annuals. The cattle, he remarked, did not allow the seeds to come to maturity, and hence they disappeared. I thought this was rather a curious statement when I saw it, as annual grasses do not predominate in natural pastures; and Professor Warder, of Cincinnati, assured me that the statement of Kalm was not correct. But the perennial grasses of the natural prairies are rapidly disappearing under pasturage, as well as the great variety of wild-flowers with which they were at one time adorned in early summer.

The prairie regions form a great feature in the natural vegetation of the American continent. A line drawn from the centre of Southern Michigan to St. Louis, and extending to Texas, would form a rough boundary betwixt the wooded and the treeless country. West of this line, the trees are generally stunted, unless along the margins of the rivers, whereas the country eastward to the Atlantic coast was almost everywhere densely clothed with timber when discovered by Europeans. The sketch will show the prairie regions of North America with greater distinctness. The phenomena connected with the smaller fall of rain west of the

Mississippi during the cold months will be afterwards ad-
verted to.



Twenty miles before reaching Chicago the country became a dead level, rising only a few feet above Lake Michigan. It is damp and marshy, and covered with coarse rank grass, which cattle do not touch in summer. It was rather late before I arrived at the town, and the night was very dark. The long withered grass was on fire in several places, and the flames, from four to five feet in height, advancing in a line several miles in length, formed a most magnificent sight. On arriving at Chicago there were upwards of twenty omnibuses waiting to convey the passengers to different parts of the city, besides as many waggons for luggage. The town apparently had risen so rapidly that there had been no time to pave the streets, which were almost impassable, except one broad street covered with planks. The hotels are huge and elegant structures, and vie in their management with the first-class establishments in the eastern towns.

The wharves at Chicago were crowded with steamers,

and the immense piles of goods around the railway stations bespoke the general plethora in trade and commerce. Indian corn, wheat, wool, beef, and bacon are the chief exports. For some time in the autumn of 1855 one million of bushels of wheat were delivered weekly in the town. Several vessels have taken cargoes from this harbour and gone direct to Liverpool. The greater part of the wheat is of secondary quality, being nearly all sown in spring. I observed small steamers having machinery fitted up for taking grain out of one vessel and putting it into another. They were also made available for lifting it out of the vessels and storing it into granaries. The wages of common labourers, being from 4s. 6d. to 5s. a day, act as a great stimulus to economise manual labour.

One afternoon I had a drive into the country for a few miles with a manufacturer of reaping-machines. He went out to make a trial of one in cutting the withered prairie grass, and it did its work remarkably well. He informed me that he had manufactured 700 of these machines last year, and would make as many this. The level prairies are admirably suited for reaping by machinery; and where labour is so scarce and high-priced, the reapers have been a great boon to the large farmers.

On my way back to town I was surprised to notice so many handsome villas in the suburbs along the shore of the lake. The best houses are made of sandstone, which is the finest I ever saw: being close in texture, and almost as white as marble. The rise of property around the town has been enormous within the last four years. Land two miles out along the lake shore sells at £200 per acre, and some in the suburbs as high as £2000. The progress of Chicago has been remarkable; indeed, excepting San Francisco in California, no town in America has risen so rapidly. It only contained 4479 inhabitants in 1840, and now there are nearly 80,000, about double the population of Toronto in Upper Canada. This amazing growth has been stimulated by the formation of railways and canals through the immense tract of rich prairie country, which offers to be the most productive region for grain in North America. The facilities which now

exist for transporting the produce of the interior have already tapped its agricultural capabilities; hence the commercial prosperity that has arisen in exporting that produce, and in importing and circulating the large supply of the necessities and luxuries of life, which the inhabitants of a rich and newly-settled country invariably require. Thus in the free States which possess a good soil and an easy outlet for the produce, thriving towns rise up like mushrooms; all classes live well; the vast majority dress well; and if countries ever have a golden age, Upper Canada and the Western States are now enjoying theirs.

CHAPTER VII.

CHICAGO TO BALTIMORE.

4th November 1854.—Left Chicago this morning by the Galena Railway, and came out of the train at Wheaton Station, twelve miles to the west. The country continues flat and marshy for six miles after leaving Chicago, and then becomes undulating or rolling dry prairie. I drove south in the coach from Wheaton to Napierville, a distance of six miles. The prairies have a desolate appearance at this season, as the natural grasses are withered, and impart a somewhat barren aspect to the landscape. The air, however, is usually dry and bracing at this late period, and serves to render a run over these waste-looking champaigns far from being unpleasant. The scenery at first is novel and striking, though it soon becomes monotonous; for the only changes in its features are portions that have been under crop, natural prairie, and thin oak plantations having the dwarf oak as undergrowth on the tops of the ridges.

In some parts large fields were in oat-stubble, which was more than a foot in height, and the crop was built up in ricks without any thatching. The climate being so dry they would not be thatched though they stood for several years. I saw few fields of autumn wheat on the prairies; and those I saw were mere patches. Passed one small field that was very thick on the ground, and nearly a foot long; and from the fact of our driver "guessing," to a fellow-passenger who sat next him, that it would be a good crop, it would appear that forward wheat is preferred in this part of the country. It is owing to the nature of the soil of the prairies, and not to the climate, that so little wheat is sown in autumn.

This appeared quite evident from the fact of autumn wheat being sown on all the gravelly soils of the prairie knolls. The high winds, attended with intense frosts in winter, often destroy the wheat plants, and the spring frosts and thaws also are apt to throw them out of the loose and open prairie soils. These agents, and the tendency of the wheat to mildew, are the causes of so little being sown in autumn. Wheat succeeds well as a first crop when the prairies are broken up, for the plants obtain a firm hold among the roots of the natural grasses and herbs, but as soon as the turf becomes mouldered down into a loose and friable soil, it is liable to suffer from the winter and spring frosts, and is then far from being a sure crop. For these reasons it is not probable that the prairies will ever produce much fine winter wheat, but I am greatly mistaken if they do not become the principal region for the growth of spring varieties, which can be raised with great facility.

Since the natural grasses of the prairies have been pastured by cattle and sheep, they are not nearly so vigorous, nor were they ever so productive as is commonly believed, for they are late of growing in spring, and do not support stock in this part of the country until the end of May, while they again wither by the middle of August. It requires from five to six acres of dry natural prairie to maintain an ox throughout the year. The treading of cattle is unfavourable to the healthy growth of the natural grasses, which, when closely cropped throughout the year, become thin upon the ground, and a small leaved variety of white clover springs up. When the prairie grasses become thin from the effects of pasturing, it is now the practice to sow timothy grass in spring, after the surface of the ground has been opened by the frosts. Timothy, when once rooted, keeps its hold in the prairies; it remains green from the 1st of May till December, affording more pasturage than the natural grasses. But the dry prairies are by no means productive of grass, for, after many inquiries, I learned that their average produce would scarcely amount to a ton of hay to the acre, even when sown with timothy. In the hollows or the low parts of the wavelike surface, where the land is moist enough to maintain a

vigorous growth during the heats of summer, from two to three tons of hay may be obtained.

The productive powers of the prairies are best brought out under cultivation, which renders the light and open mould absorbent of moisture. Indian corn and oats are therefore relatively far more abundant in their produce than grasses, or even trees. The dry prairie, which only yields annually a ton of hay to the acre after it has been seeded with timothy, will produce from six to seven quarters of oats for twenty years in succession without manure, and still show little falling off in quantity. The same land when well cultivated will produce from forty to sixty bushels of Indian corn, with upwards of two tons of stalks and leaves. I do not know of any instance in which the cultivated produce of the soil exceeds that of the natural growth to such an extent as it does in the prairies.

As illustrating the influence of climate on the growth of trees and other plants, it is worthy of remark that the banks of the streams and rivers which run through the prairies are invariably clothed with timber, and the surface of the ground is comparatively destitute of the dark mould that is found in the naked prairies, and forms their deep fertile soil. Like the larger rivers, the smaller have also dug shallower beds out of the soft plateau, and their banks afford more moisture to the roots of trees. It is interesting to see how trees clothe the sides of the streams over such immense stretches of country in the prairie regions, furnishing strong evidence in support of the opinion that the prairies arise from a deficiency of rains. Dr. Hooker's remarks on the climatic conditions which favour the growth of trees in different parts of the Himalaya mountains are greatly in favour of this view. Indeed the Llanos and Pampas of South America are but extreme instances of the effects of a want of moisture at certain seasons of the year being adverse to the growth of timber. The thinly timbered lands of the oak openings in Canada West are the first symptoms as we go westwards, of the climate becoming less favourable to the growth of trees; and as we approach the Mississippi, the natural grasses that clothed the surface of the ground when

the white man first took possession, indicate that their habits are better suited than those of trees to a scanty and less regular distribution of rain. •

I visited several farms in the neighbourhood of Napier-ville. Ordinary land, twenty-five miles from Chicago, with suitable farm-houses, is worth from 25 to 32 dollars an acre. I walked over one farm of 230 acres, which cost 25 dollars an acre four years ago, but was now worth 32. I saw a man ploughing a field of oat-stubble which had borne its twelfth crop last year, and that was too heavy. The plough was light, with a broad share, and cut a furrow eight inches in depth and fully a foot in breadth, and did its work remarkably well. I took hold of the implement, and I certainly never before assisted in turning over such a depth of fine friable sandy mould of a dark colour, which was no doubt partly owing to the presence of particles of charecoal, resulting from the repeated burning of the prairie grass. There were no stones in it, and the plough-irons were almost as sharp as a knife. From the fact of the subsoil containing clay, which can be turned up as soon as the surface soil becomes wasted, the prairies may be rendered productive for many years, even though no manure is applied. The fertility of the prairies, however, is not so great where the vegetable matter is in excess, for in these cases they approach somewhat in their nature to peaty soils, which are too deficient in earthy matter to be permanently productive. There are few or no root weeds to be seen in the prairie lands, but annuals grow up with great vigour in summer; and to keep them down, the frequent use of the plough among the Indian corn is required.

Another farm I visited consisted of six hundred acres, but there was not a great deal of it in crop. Its owner had lately visited California by driving right westward in his own waggon, a journey of three months' duration. There were only 70 acres Indian corn, 30 wheat, 50 barley, and 50 oats. Formerly he used to raise 300 acres of spring wheat, but was now grazing more. There were 1000 sheep on the farm, which were partly grazed on other lands. The greater portion of the grain was given to pigs. A monster reaping-

machine was standing near the buildings and going to decay ; it required eight horses to work it, for it was not only intended to cut the crop, but also to thrash and sack it.

I also paid a visit to a farmer who came out here from Dumfries with his family fifteen years ago. He bought 1200 acres, for which he gave £300. Latterly, he divided this property among his sons and sons-in-law, who each had about 140 acres. On this extent they each kept a man-servant and two horses. The master and servant, without any assistance, managed the stock upon the farm, cultivated, harvested, and thrashed 25 acres of Indian corn, and 50 of oats and wheat, and took the produce to market. The yield of spring wheat varied from 10 to 30 bushels to the acre, and Indian corn from 40 to 60 ; average about 50. The cereals are chiefly cut by machinery, and mowing machines for grass are also coming rapidly into use. On the best managed farms little rotation is observed, the most approved mode of cropping being Indian corn, autumn wheat, spring wheat, oats. The prairie farmers have the idea, that "land has new life put into it by cultivating Indian corn." But no other crop possesses greater capacities for expanding under liberal treatment, and giving a good return for manure. On one of the farms of 140 acres, 30 cattle of different ages were kept, which required to be foddered with hay for five months in winter. The fact of two men managing so much arable land shows how easily it can be cultivated. There is little manure, and what is collected is not greatly eared for, as a man's labour is no doubt quite as well applied here in cultivating land as in manuring it. One of the implements which economises labour to the prairie farmer is the railroad thrashing machine. The whole apparatus is light and portable, and goes into so little compass that it is the most handy machine imaginable. Two men can work it and attend to the horses. Where labour is so high priced, this is a most invaluable machine. If ever horse power be applied in Britain to the cutting of roots for stock, or other light work at present done by hand power, the railroad principle will undoubtedly be adopted. The same mode of applying horse power is greatly used in America for sawing wood as well as for other purposes. There is

still a large quantity of grain trodden out by horses in Illinois.

The cereals are nearly all cut by horse power on the larger farms in the prairies; but everywhere there seemed to have been a great waste of grain in the harvesting. The oat stubbles were overgrown with what had been shed out in reaping, and were now affording pasturage nearly a foot in length. All the grain crops often ripen about the same time, and unless they are quickly cut down, immense quantities are shed out. Indian corn, however, is not liable to waste, though it is allowed to stand in the field long after it is ripe. I went into a large field which was still untouched, where the stalks were standing over the ground from ten to eleven feet high. The owner told me that the grain would not be injured though it was allowed to stand till January. The cobs containing the grain are protected from the rains, as they hang down from the centre of the stalks, and are thickly covered by folds of sheath. The stalks of Indian corn are not collected and used for manure; in spring, a roller is usually put over them, when they are drawn together by a rake, and afterwards burned. On those fields on which wheat was sown, it had just been harrowed in amongst the stalks of Indian corn, which would afford some protection in winter.

From the proximity of this part of the prairie to the shipping port of Chicago, a portion of the grain raised is every year sent to market, the quantity varying according to the price. The farmer from Dumfries informed me that, for the last fifteen years, the lowest price of Indian corn at Chicago was 28 cents, or 1s. 2d. a bushel; the average price about 50 cents. Within the same period, winter wheat had been as low as 50 cents; average about 80. The distance to the town was 34 miles, and the roads were often bad. Beyond this distance it is not so economical to send large quantities of Indian corn to the shipping ports; and as the centre of the State of Illinois is approached, the most of this grain is consumed by cattle and pigs, by which means the produce of the country is put into little compass, and more easily exported.

The mode of feeding hogs in the central parts of the State of Illinois, where the most of the Indian corn is what is called "hogged down," will be learned from the statement of Mr. Phelps of Peoria county, to the Commissioner of Patents at Washington:—"Hogs with us in the spring are turned into a clover field, with plenty of salt, and light feeding of corn, where they remain until about the 10th July, when they are turned into a field of oats to keep themselves. These last them a month or six weeks, when the feeding on corn commences. First, and for a time, it is cut and hauled to them when the stalk is green and juicy, and both stalk and ear are eaten with a high relish. During all this time the animal has been growing thriftily, developing in size, bone, and stamina, and is in the best condition, as the corn ripens and hardens, to lay on fat with rapidity. The closing period of feeding, in November and December, upon ripe grain, gives to the flesh the purest and most desirable character. Thus, with comparatively little labour, at a cost of about eight or ten bushels of corn, or its equivalent in other food, for every 100 pounds, we produce pork in the open fields, with temporary shelter towards the close, and find it remunerative even at the lowest prices. Hogs properly reared for in this way will weigh, at twenty months old, from 200 to 400 pounds."

The economy of consuming the maize that is raised in the central parts of the Western States, such as Illinois, by pigs and cattle, will be obvious when we reflect on the expenses of transportation. The average price of this grain at Chicago is 50 cents a bushel; and according to Mr. Seaman, the ordinary cost of transporting a bushel of wheat or Indian corn by teams is 40 cents for a hundred miles. This statement of the cost of transportation approximates very closely to an estimate that I had formerly made. In the Western States, the price of the labour of a man and a pair of horses for a day is about nine shillings English money, or fully the value of four bushels of Indian corn at Chicago. If we suppose forty bushels a sufficient load for two horses on the prairie roads, the whole value of the load would be exhausted in a journey of nine days' duration—equivalent to a distance

of about 125 miles. Wheat, of course, would bear to be transported double the distance. But it is estimated that a bushel of Indian corn weighing about 55 lbs. will, in fattening pigs, make 10 lbs. of pork,* which, at 4 cents a pound, the common price of bacon in the west, would leave 40 cents for a bushel of Indian corn converted into bacon.

In some districts in Illinois of great fertility, the quantity of grain that is produced is extraordinary. The county of Sangamon in the centre of the State contains a total area of 750 square miles, and had only a population of 19,228 in 1853, of whom 6500 were in Springfield, the capital of the State, 230 miles from Chicago. The produce, by the census returns of 1850, was 3,318,304 bushels of Indian corn; 104,126 of wheat; 335,008 of oats; 120,868 pounds of wool; and 377,272 of butter. These figures must furnish a very large return per head for those engaged in agriculture. The greater part of the Indian corn and oat crops, however, are not reaped, but consumed on the fields by hogs and cattle.

More than three-fourths of the surface of Illinois consists of prairie. In many parts, not a tree or shrub is to be seen in the distance, a circumstance which has prevented its being cultivated. Wood for fuel and fencing is one of the first requisites to the working farmer, and he will rather hew for himself a farm out of the forest, than sit down upon the treeless prairies. Immense beds of coal extend through the country, however, which will no doubt soon be made available, as they are often very near the surface. The locust tree also has been planted on many farms for shelter, and with the view of obtaining wood for fencing and fuel. It has been rapid in its growth, and holds out the prospect of being of great utility to the prairie farmer. Mr. Ellsworth of Naperville informed me that apple trees thrive well upon the prairies, but that they require *to be well cultivated for six or seven years when planted*. Thus it seems that the fertility of the

* It is curious that this is very nearly the same increase that Mr. Huxtable obtained in feeding pigs with bean and barley meal and a mixture of pollard and bran, for 54,204 of this mixture made 10,152 lbs. of meat.—“*Present Prices*,” page 26.

soil does not make up for its peculiar physical condition, because if mere fertility had only to do with the matter, it is altogether a mystery why the granites and sands of New England are so productive under apple orchards which are neither tilled nor manured, and yet are so unproductive under grain crops. Peach trees do not bear well on the prairies. The reason assigned is, that the blossom comes out too soon in spring, and is destroyed by the late frosts. One farmer told me that they grew so rapidly that the winters frequently killed them. I could also believe that the constitution of all trees that grow upon the "mucky" soil of the prairies must be weaker, and therefore more liable to suffer from intense frosts, than those that grow upon sounder land. At home, many facts bearing out this principle are observed in our cultivated crops, and doubtless somewhat similar conditions are not without their influence in this extreme climate.

Even at this immense distance from the ocean, the weather is far from being steady in its character. Though it never remains long damp, it undergoes great and sudden changes of temperature. At this season, the air is much longer in becoming warm than cold, or in other words the change from heat to cold is much more rapid than from cold to heat. On the morning of the 5th November there was a crust of ice an inch thick on the running water at Napierville, and after sunrise it blew a stiff breeze from the south all day, but notwithstanding that the latitude is lower than that of Rome, it continued cold the whole day, not a cloud was seen, and the sun set as red and fiery as it does in Scotland when there is hard frost in winter. This instance again served to impress upon me the immense extent of territory over which the northerly winds of the previous two days had swept to the southwards, and diffused their cold breath. I could readily believe the statement of the prairie farmers, that the south winds are very cold in winter for the first day that they blow. Mr. Ellsworth, who has an extensive nursery at Napierville, said, *that due west winds are the coldest in winter*, at which I was rather surprised, but I subsequently found that this was the case over the United States, with the exception

of those States bordering on the gulf of Mexico. This gentleman also maintained that the climate was more changeable here than in New England, of which he was a native. In summer he had known the thermometer sink in the shade from 90° to 54° in half an hour.

Napierville, though a small place of 1000 inhabitants, has already a good school and two churches, one belonging to the Baptist, the other to the Presbyterian denomination. The hotel at which I put up for a day or two was kept by a German, who had everything in good order, so that I did not grudge, by any means, my bill of a dollar a day for bed and board. The system of large numbers dining together, goes on in the villages as well as in the towns; for here, about forty persons sat down to the different meals. The company consisted of mechanics, shopkeepers, and hostlers, and though homely dressed, and wanting the polish of the same class in the New England villages, they were civil and obliging. An election by ballot occurred on one of the days that I was here, but a very tame affair it was, for there was no excitement. It is the Presidential elections that call out the most voters; the choosing of the local politicians does not create so deep an interest.

8th November.—Left Napierville this morning for Wheaton Station, from which I took the cars to Galena, about 160 miles west from Chicago. This line was recently opened, and the carriages were fitted up in a superior style. A large party were in the train on their way to celebrate the opening of the railway by a ball in Galena. The country through which we passed is prairie throughout, with some groves of stunted oak growing on light gravelly eminences. Frequently, however, there was no object visible but the wild waste of prairie; no trees and no traces of cultivation. But before reaching Galena, the road skirted along some valleys where the broken table land is again covered with wood, and the thick vegetable mould is awaiting.

Galena, situated upon Fever river, owes its prosperity partly to the rich lead mines in the neighbourhood; and contains a population of 12,000, who support two daily papers. I was

surprised to see such huge castellated structures of steamers in the small river, which was only two and a half feet deep in the channel. It is spanned by a peculiar suspension railway bridge that moved on a pivot to allow vessels to pass.

Next morning I set out on foot to see the Mississippi, five miles distant, and to inspect the lead mines which are worked in the magnesian limestone. The weather was remarkably fine, indeed too warm for walking, for the south wind which had been blowing for nearly two days, once more brought up a high temperature. This, however, was the last in this quarter of the really beautiful weather of the American autumn. A native predicted that this would not last long, and that it would probably be very cold in a day or two. A prediction that was soon verified. I also now learned, that in consequence of many of the boats having ceased to run on the river, there was little prospect of getting down to St. Louis for a day or two, so I determined to return to Chicago.

The lead ore is found in the veins of the limestone, at no great depth from the surface, and contains about seventy per cent of metal. The miner's wages are from a dollar to a dollar and a half a day of eight working hours. The rent of the mines is from one-fourth to one-tenth of the produce; averaging about one-sixth. From the facility with which the ore can be extracted, mining has been a very lucrative undertaking.

At this distance from the sea the Mississippi is a noble river, and worthy of its title—the father of waters. It is three-fourths of a mile in breadth, with thirty feet of water in its channel, and having a strong current. It is full of wooded islands, and its cliffy limestone banks are also clothed with trees. Here, too, the physical features of the country are very similar to those in the vicinity of Cincinnati, the river having excavated a bed for itself out of the plateau, and the country on both banks being broken into hillocks. The soil is destitute of the dark prairie mould, and consists of a rich loam; but from the irregularities of the surface it is only the poorest settlers who occupy it.

I crossed over the river to the Iowa side in a small boat

propelled by paddle-wheels, each of which was driven by a horse turning an endless web, as in the railroad thrashing machines. The crew consisted of two boys, one about fourteen years of age, and the other eight, who had all the airs of old men, and acted their part remarkably well. It was a frail vessel, however, and I was glad when I landed on the other side. I walked about five miles up the river bank, sometimes along the edge of the water, and sometimes through fields and woods. The oak was common, and where it was growing in the forest not too densely, the acorns that had recently fallen literally covered the ground. In my notes taken at the time, which referred to the trees growing along the banks of the Mississippi, I find it stated:—"This rich soil does not appear to be so propitious to the growth of wood as the barren soils of New England, where the roots of the trees have nothing but rocks and stones among which to fix themselves." This inferiority, as already stated, there is every reason for supposing is owing to the drier climate of the Western States.

There is also a great extent of prairie stretching through the State of Iowa; and thither vast crowds of emigrants from the Eastern States have been flocking. I learned that no fewer than 100,000 had gone this year. Indeed hundreds of emigrants pass through Chicago daily, in summer, to the western territories. The land has now risen so much in Upper Canada and the States south of the Lakes, that it can seldom be purchased by European emigrants, who can only become proprietors by going westward, to the confines of the untouched forest or prairies. From the accounts that I received, the prairies are not so extensive in Wisconsin as in Illinois; but they are much better mixed with timbered land, which circumstance renders them more tempting for settlements; and plenty of such land can still be had at ten shillings an acre.

The water of the Mississippi is here very pure; it rises about fifteen feet in spring, when the snows melt in the upper country. The river freezes usually by the 1st December, and remains closed till the 1st April. I crossed in a small steamer that only drew fifteen inches of water. The boiler

was placed on one side and the engine on the other. It was with some difficulty that we reached the opposite landing, as the wind blew pretty strong from the south. I had hardly got out of the boat before the weather changed very rapidly; clouds came from the west, and rain soon began to fall with a damp and close atmosphere. Next morning (the 10th) the sky was overcast while the wind was blowing from the west, with the temperature only a little above the freezing point. This change was very remarkable; and on going to Washington, I examined into the state of the weather prevailing over the United States during a few days about this time. I found that if I had started from Galena on the afternoon of the 9th, and travelled due east to the Atlantic coast, a thousand miles distant, at the rate of ten miles an hour, I would have experienced hot and moist weather all the way. I left for Chicago on the morning of the 10th, and the weather was very cold all day, with hard frost at night.

Leaving Chicago early in the morning of the 11th for Indianapolis, I had breakfast at Michigan city, a small straggling town. Frost very hard at sunrise, and the sky without a cloud the whole day; sun very powerful, though cold in the shade.

The northern part of Indiana is level, with a considerable extent of marshy ground. One part of the railway south of Michigan city is a straight line, seventy miles in length. When there is not too much vegetable mould, autumn wheat and Indian corn are sown alternately. The corn stalks were usually still standing, and the wheat had been merely harrowed or grubbed in. The southern part of this State is well wooded; and the soil rests upon limestone gravel and is productive. The distance from markets keeps down the value of the land; and the greater part of the Indian corn is consumed by hogs. The bottom lands along the Wabash are particularly fertile.

I was surprised on looking out of the window of the hotel at Indianapolis on the morning of the 12th November to find the ground covered with snow. It continued to fall nearly all day, so that it lay four inches deep in the afternoon. All parties said this would not last long, as mild weather

would soon return. Cattle are not stabled in winter in this part of the country, and the cows were taking shelter from the falling snow beneath the trees that lined the streets. The farmers also who came to town to church merely tied, or, as they say here, "hitched on," their horses to the railing, where the animals stood exposed to the weather all the time that their owners remained in town.

Took the cars from Indianapolis to Columbus, Ohio, on the morning of the 13th, but from the irregularity of the trains, I did not reach my destination till late at night, though the distance is only 176 miles. I met a farmer and miller in the train, who resided in the southern part of Indiana. He informed me that the wheat crop this year would not yield more than eight or ten bushels to the acre. The average produce of the best wheat soil in this part of the country was not more in ordinary years than eighteen bushels an acre, as it produces too much straw, though not one farmer in fifty applies any manure to his fields. However, Indian corn averages seventy-five bushels to the acre. Four years ago the price of this grain was only ten cents a bushel in Southern Indiana, and the ordinary price was only about fifteen cents before the railway was opened. Barley is more productive than wheat, often giving fifty-five bushels an acre, when the crop is winter sown.

Farms of the best land on the river bottoms that sold six years ago at 17 dollars an acre, were now worth 30. A man with two horses will cultivate 30 acres of Indian corn and 40 of wheat if he obtains the assistance of a boy to plant the corn and to harvest the wheat. I was told of one instance in which a man and two boys had planted and cultivated 125 acres of Indian corn and 50 of wheat, and saved besides 80 acres of meadow hay. The ease with which these soils can be kept free from weeds, and the fact of no manure being applied, render a given area much easier cultivated than in the early settled parts of the country. In the cars I also met a grazer, who buys cattle and puts them upon the prairie lands that have been taken up by speculators, but upon which settlements have not been made, and no one looks after them. He usually keeps 150 cattle, and is well pleased

when their value is increased 10 dollars (£2) a head in twelve months.

Columbus is the capital of Ohio, a thriving town of 25,000 inhabitants. The State House will be a very handsome building when completed; it is quadrangular, with many Corinthian columns in front, and is estimated to cost £400,000. The town is built on the east bank of the Scioto. The general level of the country did not seem to be more than 30 or 40 feet above the river. The surface undulates in long waves and is covered with fine timber, but the soil is rather stiff and clayey. The alluvial or "bottom" lands of the Scioto are about three miles in breadth at Columbus, and extend about 190 miles from its junction with the Ohio, and form the most fertile tract in the State.

In company with Professor Mather I paid a visit to a gentleman who owns a large extent of land, stretching eight miles to the west of the city, and averaging about two miles in width. There were about 5000 acres of this property cleared, and sometimes he farms it all himself, at others lets it out in shares. This year he had 2300 acres in Indian corn, and 250 acres in wheat. More than one half of the property was still under wood, which is thinned to allow the grasses to come up and afford pasturage for stock. Herds of lean-looking sheep were running in these wood pastures, and from 200 to 300 mules are reared every season. For several years this description of stock had paid better than any other; a mule colt being worth from 50 to 60 dollars. The best soils yield two and a half tons of hay an acre, and three acres will support a bullock throughout the year. Hay sells at ten dollars (£2 : 1 : 6), but is not worth more than five for feeding purposes. It is considered good payment if an ox leaves the feeder a dollar a month all the year round.

When the present proprietor of this land was at college, his father, who was one of the first settlers here, got no more than five cents (twopence halfpenny) for a bushel of Indian corn, and this was the only way he had of raising money. Five years ago beef was a cent and a half a pound, but now it ranges from six to ten cents. Yet this fine estate, in this really beautiful part of the country, had little attraction

to its possessor, for he was to let it to tenants and remove to the bleak prairies of Illinois, where he had lately bought a farm nine miles in length by six in breadth, which he proposed to cultivate by hired labour. This prairie land was purchased at the government price, one dollar and a quarter an acre. He calculated that Indian corn would yield 30 bushels an acre for the two first years in that part of Illinois, which would be worth about six dollars, to feed hogs and cattle. The prairie land becomes more productive of corn after it is cultivated for a few years.

The best land on the Scioto bottoms lets at 20 bushels of Indian corn an acre, and only at seven bushels of wheat, in the latter case the proprietor giving the seed. While on these fertile lands the average produce of wheat is not more than from 15 to 18 bushels an acre, and 40 bushels are scarcely ever heard of, 150 bushels of Indian corn are sometimes got. I was shown a field that had borne Indian corn for 56 years in succession, and yet did not show symptoms of falling off. The Scioto bottoms is a dark-coloured loam, easily cultivated, and retentive of moisture when tilled in summer. It is worth about 50 dollars an acre, and the heavily timbered land on the higher grounds from 20 to 40 dollars an acre.

A man with two horses will cultivate 25 acres of Indian corn on the Scioto bottoms, and can do all the labour that is required in ten weeks. So little is the crop injured by the weather that it can be harvested in winter or even in spring if not found convenient to do it sooner. Indian corn is so easily raised in this part of the country, that a bushel of it can be had in ordinary years for as little money as a bushel of potatoes. This is not a good climate, however, for potatoes, as it forces too many stems, and the tubers are small and watery. Turnip and beet grow well, and the former may be raised, the same year, on land from which a crop of wheat has been taken, for wheat ripens here by the 1st of July. What a productive country this will become when labour can be profitably applied in cultivating those cattle crops which tend more surely to spare and husband the resources of this grateful soil!

Ohio possesses a large extent of sandy loams, which would be considered too light in Britain to rank as good wheat soils. The climate is warm and moist in summer, and all the lighter descriptions of soil are thus rendered fertile for wheat and maize. With the exception of the bottom lands of the Miami and Scioto, I was not by any means struck with the natural fertility of any land that I saw in this State. Indeed, the same observation may be made in regard to Canada and all the Free States. The prairies, no doubt, are capable of producing very heavy crops of Indian corn and spring wheat for many years to come, though no manure is applied. But still I saw no wide champagnes of rich soils in America that, with respect to natural fertility, can be compared to the marly loams of the north of France, which, were they in this climate, would, like the Scioto bottoms, be too rich for wheat.

The northern half of the State of Ohio and the eastern borders are best suited for the growth of wheat: the southern for Indian corn and for grass. There is comparatively little alluvial land along the Ohio, as it has cut a deep channel out of the table land, and, as already observed, the whole country on both sides is broken into hillocks. A surface so irregular, being less suited for cultivating on a large scale, naturally becomes occupied with smaller proprietors, who usually plant crops, such as tobacco and vines, which require more hand labour than those that are more generally raised. The farms are larger on the more fertile descriptions of land. The county of Ross, having an area of 730 square miles, is intersected by the Scioto, and has a large extent of rich bottom lands. The relative quantity and kind of produce grown upon rich level land, and on that which is more broken, is not without interest. In 1850 the county of Ross produced—

Indian Corn	.	.	.	2,840,443 bushels.
Wheat	.	.	.	141,131 "
Oats	.	.	.	80,926 "

The county of Brown has an area of 502 square miles, and is bounded on the south by the Ohio. Its surface is consequently very much broken in the vicinity of the river,

where the properties are smaller than on the more level and fertile portions of the State. If the soil is suitable, small farmers raise tobacco. The produce of this county in 1850 was as follows :—

Indian Corn	1,209,485 bushels.
Wheat	192,065 „
Oats	180,810 „
Tobacco	1,279,510 pounds.

There is little unreclaimable land in Ohio, though a large proportion is still in wood. This State is about 200 miles in length, and nearly as many in breadth, and covers an area of 39,964 square miles, or 25,576,960 acres, of which 9,851,493 were reclaimed in 1850. To show the particular direction that agricultural production takes north and south of the Lakes, the statistics of Ohio may be compared with those of the Canadas. In 1850 there were 7,300,839 acres of reclaimed land in the Canadas, out of 155,188,425 acres. The population of the Canadas was then 1,842,265; of Ohio 1,980,427. The amount of their chief products were :—

	CANADAS.	OHIO.		CANADAS.	OHIO.
				Lbs.	Lbs.
Wheat.....	16,155,946	14,487,351	Cheesc.....	2,737,790	20,819,542
Other Cereals, } etc.....	28,052,301	15,981,191	Butter.....	25,613,467	34,449,379
Indian Corn	2,029,544	59,078,695	Tobacco	1,253,128	10,455,449
Sheep.....	1,597,849	3,942,929	Wool.....	4,130,740	10,196,371
			Maple Sugar....	9,772,199	4,588,209

The State of Ohio raises a greater amount of agricultural produce than the whole of the British Possessions in North America, and in all probability it will continue to do so for many years to come. The grain exporting region in Canada is limited to the soils that rest upon the secondary formations. The soils of the unoccupied lands of Canada rest upon the primary rocks, and will only be slowly taken up by the poorest settlers obtaining free grants of them.

The statistics indicate the prominent place that Indian

corn occupies in the productions of Ohio, and the small quantity grown in the Canadas. As already remarked, I attribute this to the small amount of labour involved in its culture in Ohio in comparison to what it requires in the Canadas, or the north-west portions of the State of New York.

The cultivated lands in the Canadas have the Lakes and the St. Lawrence stretching along their whole extent, which afford great facilities for transporting their produce. Ohio possesses upwards of 700 miles of canals, and 2000 miles of railways. The productive powers of Ohio for wheat cannot be said to be fully tested, as the farmers are induced by the expense of transport to cultivate more Indian corn and to consume it by hogs. For were the comparatively high prices of the Atlantic towns to be within reach of the Ohio farmer, doubtless a very large amount of wheat could be raised on land which is now devoted to Indian corn.

I left Columbus on the 15th November, and stopped all night at Pittsburg, having travelled 246 miles. It was late before we arrived, as our train got off the rails, which detained us for some time. Country very level until the Ohio is approached at Pittsburg, where the surface is again broken into hillocks. Passed over a large extent of a red-coloured sandy soil, upon which wheat was the principal crop. It was very forward, and much of it had been sown by drill.

Pittsburg is a dirty town, and for smoke may compete with any in Lancashire. It is built on the steep banks of the Ohio, and the strata here, through which the river has dug, belong to the coal formation, which covers an area almost as large as the whole of England. The coal beds are horizontal, and the river has cut through many of the upper beds, which are thus exposed along the banks, rendering mining a comparatively simple operation.

Next day's journey to Harrisburg, a distance of 248 miles. Country broken after leaving Pittsburg, and about midday the summit level of the railway, far up the flanks of the Alleghany range, was reached. The tops of the hills are covered with pines, and their sides, where the forest is not too dense, have a thick undergrowth of rhododendrons. The scenery was very grand.

and in some parts the view from the carriages was terrific. As the line wound round the highest peak that we passed, the curves were very sharp, so much so that the sleepers were sometimes laid at a high angle towards the hill, and thus the lower sides were next the valley. The passengers instinctively rose and took the highest side of the carriage. The gradients were steep, but the engines were powerful, and the road was kept in good order and well managed.

The railway runs through deep valleys to Harrisburg, and the land is poor and stony. The farms are small in Pennsylvania, and the soil is by no means so productive as that of Ohio. It contains upwards of 29 millions of acres, but little more than eight and a half millions have been reclaimed. This State, however, produces as much wheat as any other in the Union. The surface is much broken in the central parts by the Alleghany range. Where the soil rests upon the limestone rocks it is productive both for grass and grain. It has upwards of 1100 miles of canals for transporting coal and agricultural produce. It costs 20 cents (tenpence) a bushel to carry wheat by canal from the towns in the centre of Pennsylvania to Philadelphia, a distance of 200 miles. The country is level along the Atlantic coast, but it is very poor and sandy.

I met a Pennsylvania farmer who resided within twenty miles of Philadelphia. His land was worth 100 dollars or £26 sterling an acre, and it would rent at 400 dollars a year. He raised 10 acres of wheat, and 10 of Indian corn; the average produce of the former is about 25 bushels an acre, and of the latter 60 bushels. After Indian corn oats are generally sown, then wheat, to which all the manure produced in the farm is applied. The rest of the farm is in grass and meadow, for when the land is sown down after the wheat crop, it is allowed to lie for six or eight years. The timothy grass is sown in autumn, and the clover in spring. The pastures are ploughed in autumn or in spring, and maize is planted in four feet squares, which permits of the crop being thoroughly cultivated during summer, and little hand hoeing is required. Twenty cows were kept, and their produce is made into butter and sold in Philadelphia. A cow, when the

produce is disposed of in this way, will yield 35 dollars a year, and 55 when the milk is sold in town, but an ox will only yield about 25 dollars when fed throughout the year. A ton of hay with straw will winter a cow, and Indian corn meal is allowed in spring when she is giving milk. Besides himself, he employed one man servant, and kept three horses. He paid from 35 to 40 dollars in taxes every year.

Our agricultural map shows there is a small extent of land adapted for wheat on the more densely peopled seaboard States, and consequently supplies are drawn from the interior. In ordinary years the prices of wheat in the Atlantic towns are double to what they are in the towns of many of the western producing districts, and it is the only grain that will bear the expense of being transported. Oats and maize are mostly consumed in the districts in which they are grown. The enterprise of Americans was early directed towards the formation of canals, of which a large number of miles have already been completed. The following is a list of the principal canals in the United States, now in use.

New York	.	.	.	.	.	896 miles.
New Jersey	.	.	.	.	.	150 "
Pennsylvania	.	.	.	.	.	1086 "
Delaware	.	.	.	.	.	14 "
Maryland	.	.	.	.	.	191 "
Virginia	.	.	.	.	.	219 "
South Carolina	.	.	.	.	.	22 "
Ohio	.	.	.	.	.	735 "
Indiana	.	.	.	.	.	535 "
Illinois	.	.	.	.	.	100 "

The ordinary freight on the Erie Canal from Buffalo to Albany, a distance of 363 miles, is, in June and October, 20 cents (tenpence) for a bushel of wheat, and in April, May, and November, from 20 to 37 cents. From Detroit to Buffalo eight to ten cents by vessels through Lake Erie. The cost of transportation by railway is about two and a half times more than by canals. According to Mr. Seaman, a gentleman well known for his essays on political economy, Indian corn in the vicinity of St. Louis can be transported to New Orleans, a distance of 1194 miles, in arks and steamboats in a good stage of water for twelve and a half cents a

bushel, and twice as much from the Wabash river in Illinois, which floats only boats and arks of light draft. I had the pleasure of making the acquaintance of this gentleman when I was at Ann Arbour in Michigan. He presented me with a copy of his essays, in one of which he has drawn up an estimate of the average price of wheat, Indian corn, oats, and potatoes, per bushel, from 1840 to 1846, in each of the United States. The prices have no doubt materially altered since that time, but the relative values of grain in the different States are so far still maintained, though in some it has been enhanced by the opening of canals and railways. The prices stated are supposed to be those given at the nearest market towns to the places of production, without any expense to the producer except his own labour and the use of his teams.

	Wheat.	Indian Corn.	Oats.	Potatoes.
	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>
New England States	4 8	2 9	1 4	0 10
New York { Southern district	4 8	2 9	1 4	1 0
{ Northern "	3 7	1 11	1 3	0 10
Pennsylvania { Eastern dist..	4 8	2 9	1 4	1 0
{ Western "	3 7	1 8	1 0	0 10
Ohio	2 3	0 10	0 8	0 8
Indiana and Illinois	2 0	0 7	0 7	0 7
Michigan	2 3	1 0	0 10	0 7
Wisconsin	2 0	0 10	0 7	0 7
Delaware and Maryland . . .	4 2	2 3	1 4	1 0
Virginia { Eastern district .	4 2	2 1	1 4	1 0
{ Western "	2 1	1 0	0 7½	0 10
Kentucky and Tennessee . .	2 1	0 7½	0 7½	1 0
South Carolina, Georgia, and Alabama	4 2	1 0	1 2	1 0
Louisiana and Mississippi .	4 8	1 4	1 0	1 3
Missouri	1 8	0 7½	0 7½	0 10

An attentive perusal of this table will show the effect of distance from the best markets on the prices of particular kinds of produce. The wages of labour are nearly the same over the United States, but the cost of living varies considerably. As in Europe, the prices of grain have risen greatly within the last few years, which will no doubt give a great stimulus to production, as wheat is now better able to bear the cost of transportation. But the difficulties connected with exporting an increased produce are almost as great as those connected with raising it, because it is some time before

the ordinary channels can be expected to meet the extra traffic.

One rather curious fact brought out in these tables is the relatively high price of potatoes in America compared with that of grain. In Kentucky and Tennessee, potatoes are actually higher per bushel than Indian corn. This arises from the inferiority of the American climate for growing this crop; and the farther that we go southwards the more strikingly is this fact impressed upon us. And since the appearance of the remarkable disease, the differences in the prices of grain and potatoes have been enormously exaggerated. I found potatoes in the autumn of 1854 selling at £16 an English ton at Columbus in Ohio, and at the same price in New York city in the spring of 1855, and at £25 in New Orleans.

CHAPTER VIII.

BALTIMORE TO WASHINGTON.

Baltimore, 20th Nov. 1854.—My feelings on entering a slave State for the first time were not easily described. In travelling through the north and west, little incidents are now and then occurring, which show an entire absence of the class-feeling necessarily arising at home in our dense and more stationary society. The equality which prevails among travellers who observe the ordinary courtesies is striking, and we feel happy that the progressive condition of all classes admits of such a state of things. A few days ago I enjoyed the company of the frank and lively farmers of Ohio; and to-day, when at dinner, I learned that the gentleman on my left was General Scott, the hero of the Mexican war, who was receiving no more attention than I. The abrupt line, therefore, that is drawn betwixt different races appears more unreasonable; and we wonder why labour, so honourable in one State, should in another become associated with a feeling of degradation. That one class is stationary in Baltimore, the mean huts in the suburbs bear sufficient testimony.

Keeping out of the suburbs and lower parts of the town, Baltimore, so far as a staid and aristocratic appearance goes, has no rival in the Union. The exterior of the newer mansions vie with each other in tasteful ornament. The streets are wide and kept in fine order, and rows of trees line the side walks. Many elegant squares having gardens in the centre occupy the high grounds, where numerous monuments form conspicuous objects in the distance. The ladies perhaps dress a little too gaudy, but the "Baltimore Belles" do not owe their well-merited fame to what art has done

for them, nor, indeed, is it easy to over-dress a fine woman.

I called upon a gentleman in Baltimore who takes considerable interest in the agriculture of Maryland. He was an earnest advocate for slavery, and maintained that it was no drawback to the cultivation of the land. He also spoke with vehemence regarding the conduct of the abolitionists in the north, upon whom he laid the blame of having been the means of putting a stop to the attempts which at one time were made to concert measures for the gradual extinction of slavery. Schemes having this end in view were at one time openly discussed in Maryland; now, however, nothing is thought of but such measures as are best calculated for making slave property secure. But perhaps the truth of the matter is, slaves have now become more valuable. He assured me that regular societies existed in Pennsylvania to aid slaves in making their escape from their owners in Maryland, who were constantly meeting with great losses from this cause. He also stated, however, that the value of land had of late years risen as much in Maryland as it had done in the adjoining free State of Pennsylvania. Guano has been applied to many of the worn-out lands in raising wheat, with highly satisfactory results. The effects of the manure on this crop are most certain when it is applied in autumn at the time the seed is sown.

Maryland is a comparatively fertile State. Its agricultural statistics show us that there is a vast difference in the natural capabilities of land. Perhaps some may have thought that my descriptions of the general poverty of the soil in the New England States is somewhat exaggerated; but its truth will be rendered apparent by comparing their produce with that of Maryland. It is often said that slavery tends to exhaust land and to check the development of its resources, whilst free labour has effects precisely opposite. This opinion is no doubt true to a certain extent; and if it be assumed as a fact that the effects of free and of slave labour are such, it only shows more clearly that good land is not easily exhausted, and poor is not easily enriched. From all the information which I could gather, I do not think that the

cultivated land of the State of Maryland is so naturally fertile as the cultivated land of Scotland; yet how much more productive in wheat and tobacco is that Slave State than the whole of the New England States, where there is no lack of industry and activity. The agricultural statistics for 1850 put us in possession of the following figures:—

	Reclaimed Land.	Wheat.	Indian Corn.	Tobacco.
	Acres.	Bushels.	Bushels.	Lbs.
Maryland.....	2,797,905	4,494,680	11,104,631	21,407,497
New England States...	11,147,096	1,090,845	10,176,056	1,485,510

Thus, although the six Free States of New England have about four times more land reclaimed than Maryland, yet their production of wheat is less than a-fourth, and of tobacco less than a fourteenth, of this Slave State.

The comparative value of free and of slave labour is a question upon which there has been much discussion. In going into the Southern States, I was more anxious to inquire into this question than into the physical and moral condition of the slaves, a subject upon which so much has already been written. Indeed, it was one of the principal objects of my curiosity in visiting the United States, to make myself acquainted with the circumstances which favour the institution of slavery, and give it so great a hold on the agricultural and commercial systems of the country. I was amused with the view taken by an influential paper in the north on the comparative economy of free and slave labour, and as a pretty fair specimen of the way in which the merits of the question are often discussed by the northern press, I shall give the concluding paragraph. The article, after commenting upon the recent fall of labour in the north, and its continued rise in the south, sums up:—"Corn-field hands in the south bring 125 to 150 dollars a year, cooks and house-servants 50 to 75 dollars. A woman, and a child eight months old, sold the other day, brought 1310 dollars, which at 7 per cent is 91.70; this, with life insurance at 3 per cent, 39.30. Taxes, doctors' bills, and clothing, with food, must sum up the cost of such a negro to 225 dollars a year. Free women

servants with us receive from 5 to 7 dollars a month, which averages 72 a year. Children we would not have if they were given to us. The south, then, cannot stand for any length of time this competition of labour. The cost of negroes must come down, decidedly down. Hence we give the warning, stand from under."

In Maryland, an able-bodied slave is hired out by his master to work in the fields at from 120 to 150 dollars a year, and of course the person who employs him gives board, which is no doubt greatly inferior to what the free labourer receives. A common Irish labourer employed on the railway near Boston, had a dollar a day throughout the year. He paid 12 dollars a month for board, but had coffee at breakfast, meat at dinner, wheaten bread, butter, cheese, and tea at supper. Farm servants at Burlington, Vermont, had 150 dollars a year, and their meals at their master's table. In the Genesee district, the wages of farm servants were 16 dollars a month for eight months, and 12 dollars a month for the other four. The nominal hire of a slave engaged in agricultural operations is therefore rather less than that of a free labourer. The cost of maintaining the slave is also less than of boarding the free-man, a difference which will so far assist in compensating the planter for the inferior work of the slave. These facts tend to show that slave labour cannot be materially dearer than free, even in those States where the two admit of being fairly compared. This opinion is further borne by the circumstance that after many inquiries among the farmers of the Free State of Ohio and the Slave State of Kentucky, I failed to satisfy myself that there is any difference in the value of land adapted for grazing and raising grain in the two States; for had slave labour been so much inferior to free, as is commonly supposed, it should have lessened the value of property in the Slave State.

But it is generally believed that the chief profits of the Kentucky or Maryland slave owners arise from *breeding* slaves and selling them to the cotton and sugar planters in the Southern States. It appears to me, however, that the breeding of slaves could, under no conceivable circumstances, be profitable on its own account. We must remember that the

natural increase of the slave population in the Northern States is about 5 per cent per annum. This increase, therefore, being scarcely equal to the ordinary rate of interest of money, the mere breeding of slaves would not be profitable, though their maintenance did not cost anything. The natural increase of slaves is no doubt a considerable item in the profits of the slave-owner in Maryland and Virginia; yet, excepting in the rice and sugar districts, it is a far larger item in the profits of the slave-owners in the Southern States. On a cotton plantation, the sum invested in slaves bears a much larger proportion to the gross amount of the capital of the planter than where the land is only adapted for wheat and maize. The climate also of the greater portion of the States bordering on the Gulf of Mexico is quite as favourable to the increase of the negroes as that of Kentucky or Virginia.

The natural increase of the negroes on the grain-growing plantations of Kentucky affords some compensation for the inferior labour of the slave, and assists in defraying the salary of an overseer. But were more slaves to be kept than were needed to cultivate the land economically, where no crops are raised except maize and wheat, the surplus hands would detract as much from the profits of a plantation as the keeping of extra hands on a farm in a Free State would assuredly be unprofitable. Though the cost of maintaining a slave is less than the cost of maintaining a freeman, the former must yield an amount of labour which is worth his maintenance and the ordinary rate of interest on his money value. The surplus labour of the northern slave plantations finds a ready market in the Southern States, which have still so much unoccupied land. Hence, at the present time, the institution of slavery exhibits no symptoms of decay on the richest corn-growing lands of the Northern States.

Before going to America, I was very much puzzled to understand the full meaning of the following paragraph in the "Wealth of Nations." It contains, I find, a great deal of truth mingled with some errors regarding the advantages and disadvantages of slave labour :—

“The planting of sugar and tobacco can afford the expense of slave cultivation. The raising of corn in the present times cannot. In the English colonies, of which the principal produce is corn, the far greater part of the work is done by free-men. The late resolution of the Quakers in Pennsylvania to set at liberty all the negro slaves, may satisfy us that their number cannot be very great. Had they made any considerable part of their property, such a resolution could never have been agreed to. In our sugar colonies, on the contrary, the whole work is done by slaves; and in our tobacco colonies, a very great part of it. The profits of a sugar plantation in any of our West Indian colonies are generally much greater than those of any other cultivation that is known either in Europe or America. And the profits of a tobacco plantation, though inferior to those of sugar, are superior to those of corn, as has already been observed. Both can afford the expense of slave cultivation, but sugar can afford it still better than tobacco. The number of negroes accordingly is much greater in proportion to that of whites in our sugar than in our tobacco colonies.” Book iii. chap. 2.

The “Wealth of Nations,” by Adam Smith, was published in 1776, and the first census of the population in the United States was taken in 1790. The comparatively small number of slaves in Pennsylvania at that time is remarkable, there being only one slave for every hundred and twenty of the free population. At the same period in Virginia, however, there was one slave for every two and a half of the free population. The exact numbers were:—

		Pennsylvania.	Virginia.
Slaves in 1790	. . .	3,737	203,427
Free	“ . . .	430,636	544,981

The political institutions of Pennsylvania and Virginia were very different on their settlement by the English; and this difference in their original constitution had, no doubt, much to do with the great disparity which existed at the first census in the relative numbers of slaves and free-men. Pennsylvania was colonised by Quakers and Puritans, and there never was any right of primogeniture. The lands, like movables, were divided equally among all the children

of the family. In the New England States, the oldest had only a double share. Up to the period of the revolution, the right of primogeniture existed in Virginia and the other Southern Slave States, which were settled by wealthy merchants and sons of our aristocracy. The abolition of this law had a tendency to uproot slavery. The obvious way by which this is accomplished is, as soon as land reaches a certain state of subdivision, it cannot maintain both slaves and freemen. The division of land among the children has, without doubt, been the principal agent in extinguishing slavery in the Northern States, and it will be afterwards shown that the same agent is at work in all the Southern Slave States. But whilst the absence of the right of primogeniture favours the extinction of slavery, it at the same time favours its extension and renders it more aggressive.

On the other hand, rich land is one of the elements that retard the extinction of slavery. The poorer the soil, other things being equal, the sooner does slavery become unprofitable. In consequence of the natural sterility of the land in the New England States, slavery could never become deeply rooted, in cultivating the ordinary crops grown there. It could not possibly be profitable now, for the average size of farms is reduced to 67 acres of reclaimed land, of which but a small extent is in culture. Many of the New England farms are not sufficient to afford employment for their owners throughout the year, and could not do so for slaves. Had the Northern seaboard States been as fertile as Ohio, Kentucky, Indiana, or Illinois, slavery would have been longer in relaxing its hold.

The history of New York State exhibits the effects of the division of property in uprooting slavery. The eastern portion of that State is poor, and the western was of little value before the Erie Canal was made. In 1790 there were 21,324 slaves in the State, and in 1820 only 10,088. For twenty years previous to 1820, the decrease in the number of slaves was about 500 a-year, and if this rate of decrease continued till 1825, when slavery was abolished, there would have been little more than 5000 slaves at this date, when the free population numbered about 1,500,000.

Delaware, after Maryland, is the most fertile State on the seaboard. It is of small extent, and its soil is only suited for growing the ordinary crops—wheat, maize and oats. Through the subdivision of property, the average size of farms is reduced to 90 acres. In 1850 there were 6053 farms, and 2289 slaves, or scarcely one slave, reckoning old and young, for every two farms. In 1790 there were 8887 slaves, but the numbers have since been gradually decreasing. The owners of slaves in Delaware are therefore in a very small minority, and if the majority willed, the institution might be abolished. This fact shows, however, that the political feeling is not very strong here betwixt those who own slaves and those who do not. The dread lest abolition would only be a transferring of the slaves from the Northern to the Southern States, serves to check the zeal of those who wish to have the system uprooted. A good field negro is worth at present about 1000 dollars, £208 : 6s., a price which would subject slave-owners to a severe test were they put to the alternative of manumitting or of selling their slaves. It is affirmed that large numbers of slaves were sold to the southern planters when the legislatures of New York and Pennsylvania set a period for the extinguishing of slavery.

The great upholder of slavery in the Northern States is the cultivation of tobacco, and not the breeding of slaves. Slavery possesses great advantages over free labour in the cultivation and tending of this plant. This does not arise, as Adam Smith supposed, from the raising of tobacco being more profitable than the raising of grain, for if it were so its culture is as open to free as to slave labour, and it would undoubtedly be preferred. Nevertheless, in the present circumstances of the country, free labour cannot successfully compete with slave labour in the production of tobacco; for, among other reasons, slave-owners can always command the quantity as well as quality of labour that are required to raise this crop economically.

On good land, a freeman or a slave can cultivate twenty acres of Indian corn, and as many of wheat. The management of a slave property on which nothing but wheat and Indian corn are raised, is necessarily attended with great

disadvantages, because the operations are diffused over a great area, and the superintendence must be more imperfect. But in corn-growing districts, free labourers, or, more strictly speaking, *small proprietors*, have great advantages over slave-owners. A large slave plantation which may have become unprofitable through exhaustion, will not afford a profitable investment for a capitalist to buy and to farm it by employing free labourers. But such a plantation would only afford a subject for free labour *were it divided into small farms*, whose proprietors would cultivate them with their own hands. In present circumstances, this is the only process by which slavery is uprooted, and it takes place more rapidly in poor than in rich land.

Though a slave may, under very favourable circumstances, cultivate twenty acres of wheat and twenty of Indian corn, he cannot manage more than two acres of tobacco. The culture of tobacco, therefore, admits of the concentration of labour, and thus the superintendence and management of a tobacco plantation will be more perfect and less expensive than a corn one. And while slavery can always command labour, it likewise possesses the great advantage of organizing labour. Tobacco cannot be cultivated in the Free States by hiring and employing labourers; it is only cultivated there by small farmers. These circumstances give slave labour great advantages over free in the culture of this crop.

But besides these advantages, slavery admits of having an economical division of labour in the raising and preparing of tobacco for market. Mr. Babbage points out the existence of an important principle in the division of labour when applied in manufactures, that is, "the master manufacturer, by dividing the work to be executed into different processes, each requiring different degrees of skill and force, can purchase exactly that precise quantity of both which is necessary for each process; whereas, if the work were executed by one workman, that person must possess sufficient skill to perform the most difficult, and sufficient strength to execute the most laborious of the operations into which the art is divided."* The same principle applies to the organization of slave labour

* Economy of Manufactures, p. 138.

for tobacco culture, though in a different way, inasmuch as both young and old slaves can find suitable employment in the culture and preparation of the crop for market. Worms require to be picked off the plants during their growth, and the leaves are gathered as they become ripe at different periods of the season. These operations can be done as well, and consequently as cheaply, by women or children, as by full grown men. But often a small proprietor in the Free States can command no other labour than his own, which would be greatly misapplied in most of the manual operations connected with tobacco culture; because his team of horses might sometimes be standing in the stable while he was picking worms off the plants, which would render this very costly work. Thus, through the organization and the division of employment which slave labour admits of, it is virtually cheaper than free.

In estimating the comparative productiveness of free and of slave labour, one fact must be kept in view. Unless among the French settlers in Lower Canada and among the families of emigrants recently arrived from Europe, women do not assist in field work in any of the Free States, or in Canada. It is considered demeaning to the sex to be so engaged. On the other hand, negro women are all employed on the plantations, and at some operations as effectively as men. Hence, in the United States, a given number of slave population engaged in agriculture is actually more productive than the same number of free.

To produce tobacco of good quality, the land must be of a particular description. It has been already seen that the fertile summer climate of North America restricts the culture of wheat to second-rate soils, and the same thing holds with still more truth in regard to tobacco. When it is planted on rich clay soils, the leaves grow coarse and are deficient in aromatic qualities, which determine its value. On the settlement of the country, a large quantity of tobacco was raised on the rich soils; but now finer qualities of leaf being more in request, the cultivation of the plant is confined to light siliceous loams which are found to be best suited for producing the finest qualities.

Wherever the land in the Northern Slave States is of secondary quality, and at the same time not suited to the growth of tobacco, slavery never gains much footing. Slavery tends to degrade free labour, but not to the extent perhaps that is commonly supposed; for, unfortunately, the strength of the institution rests upon a broader basis. It is nearer the truth to say, that free labour cannot compete, in the cultivation of certain crops, with slave labour. Freemen no doubt think it degrading to work in the fields among slaves; and women in the south think it degrading to engage themselves as domestic servants. But freemen in the Slave States think it no more degrading to cultivate their small properties with their own hands than they do in the Free States. The census returns show that the land in the Slave State of Delaware must be nearly all cultivated by freemen, seeing there is not one slave, old or young, to every two farms; and a large number of the slaves must be employed in the towns as domestic servants.

The returns of the census commissioners bring out the truth of the preceding proposition in a remarkable manner. In 1850, the average size of farms in the Free State of Pennsylvania was only 68 acres of reclaimed land, and the quantity of tobacco raised was no more than 912,651 lbs. In the same year, the number of slaves in Maryland was 90,368, and the quantity of tobacco raised was 21,407,497 lbs.; while the average size of farms was 130 acres, or nearly double those in Pennsylvania.

If we compare, however, the counties in Maryland that raise a large quantity of tobacco with those that raise little or none, some interesting results are brought out regarding the relative numbers of free and slave population which particular descriptions of land can support. Prince George county, in the south part of Maryland, having an area of 600 square miles, is bounded on the west by the Potomac, and on east and north-east by the Patuxent. Its soil is well suited to the growth of tobacco; so much so, indeed, that it produces more than any county in the Union. The agricultural statistics of 1850 give its produce at 8,380,851 lbs. of tobacco, 1,590,045 bushels of Indian corn, 231,687 of wheat,

and 100,947 lbs. of butter. The population by the last two censuses was as follows :—

		1840.		1850.
Slaves	.	10,636	.	11,519
Free	.	8,903	.	10,039

On the other hand, the county of Cecil, situated at the head of Chesapeake Bay, having an area of 300 square miles, is not suited to the growth of tobacco. Its chief produce in 1850 was 410,060 bushels of Indian corn, 168,112 of wheat, 208,380 of oats, and 9288 tons of hay. The population during the same periods was—

		1840.		1850.
Slaves	.	1,352	.	844
Free	.	15,880	.	18,095

The county of Alleghany, also, forming the western extremity of Maryland, and bordering on Pennsylvania and Virginia, has an area of 800 square miles. Being intersected by the Alleghany mountains, its surface is broken and irregular. The soil in the valleys is represented to be fertile, and well adapted for grazing. In 1850 it produced 101,773 bushels of Indian corn, 73,525 of wheat, 163,943 of oats, 231,038 lbs. of butter, and 10,896 tons of hay. The population during the last two censuses was—

		1840.		1850.
Slaves	.	812	.	724
Free	.	14,878	.	22,045

Thus, in the tobacco-growing county of Prince George, the number of slaves increased about 10 per cent from 1840 to 1850; but in the grain and pastoral counties of Cecil and Alleghany, slavery appears to be undergoing a process of gradual extinction.

The more recently settled State of Missouri, indicates the operation of the same elements, where tobacco-raising and slaves, in a sense, go together. For the purpose of enabling my readers to estimate the result of introducing slavery into Kansas, I shall exhibit the effects of local influence in determining the relative numbers of slaves and free-men in Missouri. The following eight counties, forming the southern boundary of the State, as indicated in the sketch.

are only adapted for pasture and raising grain, and where,



consequently, slavery obtains little hold. In 1850, the numbers of free and slave population were:—

County.	Square Miles.	Free.	Slaves.
M'Donald.....	620	2153	83
Barry	703	3317	150
Taney	1540	4274	99
Ozark.....	1600	2279	15
Oregon.....	1700	1414	18
Ripley.....	990	2744	86
Butler.....	560	1563	53
Stoddard.....	900	4227	50

In reference to these counties, it may be borne in mind that the facilities are not so great for exporting the produce as along the large rivers. Slavery almost invariably gets possession both of the most accessible and the most fertile lands; but a slave population can never be dense where nothing but grain is raised. In accordance with this principle, we find the number of slaves in the following counties

on the north bank of the Missouri nearly in proportion to the quantity of hemp and tobacco that is grown:—

Counties.	Square Miles.	Free.	Slaves.	Tobacco.	
				Lbs.	Tons.
Atcheson	695	1,648	30		
Holt	470	3,830	127		
Andrew	425	8,871	662		
Buchanan	415	12,073	902		
Platte	416	12,047	2798	...	4355
Clay	415	7,590	2742	...	1288
Ray	560	8,859	1514	516,906	431
Carvel	700	4,820	621	289,869	
Charitan	740	5,736	1778	2,667,908	
Howard	432	9,079	4890	3,188,122	
Boene	648	11,313	3666	584,949	51
Callaway	743	7,104	992	957,381	
Montgomery	504	4,452	1037	353,865	
Warren	400	4,925	935	431,000	

The plateau of the Mississippi valley, stretching through the centre of the State of Missouri, is also broken, along the banks of the Missouri river, into a series of hillocks. The bottom lands along the river being very fertile, are adapted for Indian corn and hemp. The latter requires a great deal of manual labour to prepare it for market, and hence, like tobacco, it is chiefly raised by slave labour. The land, however, in the interior of the State, being less accessible, is taken up by freemen.

It is to be regretted that the "Missouri Compromise," which excluded slavery from the territories of the United States north of latitude $36^{\circ} 30'$, has been set aside by tolerating the holding of slaves in Kansas; although, at the same time, it is not very probable that this territory can ever support many slaves upon the land—perhaps the number can never exceed a half-year's natural increase of the slave population of the Union, which is now close upon 60,000.

It should be remembered that the plateau of the Mississippi valley extends but a short distance beyond the Missouri into Kansas. A large portion of the country soon attaining a greater elevation, and being less fertile and accessible, cannot be advantageously cultivated by slave labour. But the best land along the rivers will soon be occupied by slave

owners, while the inferior and more inaccessible will only be slowly taken up by free settlers, whose labour will thus be rendered comparatively unproductive.

Even a rich district cultivated by slaves may compare very favourably with one cultivated by freemen, with regard to the amount of produce that they severally raise ; yet the outward signs of prosperity in the two would be very opposite. The income of the large planter is commonly spent in a way that does not give rise to local trade and commerce. The slave population is, in a great measure, a non-consuming class, and does not promote that traffic which raises up villages and towns. These effects of slavery are always most strongly marked in those districts which have the richest soil. An exactly opposite state of things prevails in the fertile districts of the free States, where the labour of the cultivators being well rewarded, the means for purchasing the comforts and luxuries of life are diffused among all classes.

But more than this, the introduction of slavery into the new territory of Kansas will hinder the moral elevation of the poorer class of whites, inasmuch as the educating of them seems incompatible with the existence of this institution. These subjects, however, will be more fully illustrated when we examine into the condition of some of the Southern Slave States.

Large numbers of New England farmers, who entertain a hatred of slavery, have emigrated to Kansas. These men, being actuated by religious convictions of the sinfulness of slavery, are ready to lay down their lives for the cause of freedom. They have met the small slave-owners from Missouri on the prairies of Kansas, who have no greater compunction about holding slaves than holding horses or cattle, and who treat all as incendiaries entertaining abolitionist doctrines. The recent outrages which have occurred in Kansas have arisen from the conflict of these elements. Unless in the New England States, however, one fresh from the old country is rather surprised to find so little feeling against slavery in the Northern States. He will be very apt to overrate the strength of public opinion on this question in the United States, by the violence of a few of the northern

press. The fact of President Pierce relying upon the militia of the State of Indiana to act against the free-soilers in Kansas, shows that the sympathies of the Free States are not always with the side which we should naturally expect.

But to return to the agricultural aspect of slavery, we need not disguise the fact that the institution is chiefly upheld in the Northern States by the cultivation of tobacco. The fitness of the soil for the growth of this plant tends to perpetuate slavery where it already exists. On the other hand, also, the tobacco-growing powers of the Free States are longer in being developed, for the land must be considerably subdivided before farmers can raise tobacco. To take a broader view of the matter, we can scarcely suppose that the Ohio and the Mississippi form, to the tobacco soils, so well-marked a boundary as the following figures would indicate. Their explanation is to be found in the different social arrangements that prevail :—

SLAVE STATES.

	Reclaimed Acres.	Tobacco. Lbs.
Maryland . .	2,797,905 . .	21,407,497
Kentucky . .	11,368,270 . .	55,501,196
Virginia . .	10,360,135 . .	56,803,218
Missouri . .	2,924,991 . .	17,113,784

FREE STATES.

	Reclaimed Acres.	Tobacco. Lbs.
Pennsylvania . .	8,628,819 . .	912,651
Ohio . .	9,851,493 . .	10,544,449
Indiana . .	5,046,543 . .	1,044,620
Illinois . .	5,039,545 . .	841,394

Though it is not a very large sum of money that the Kentucky or Virginia planter draws from his tobacco crop, yet, by cultivating it, he finds employment throughout the year for his slaves. It thus enables him to compete with the more effective labour of freemen. Some Kentucky graziers told me very plainly that they might do quite well without slaves in their State; but in consequence of the migratory character of free labourers, slaves are far more convenient.

The country for some miles around Baltimore has a broken and irregular surface,—the soil consisting chiefly of a siliceous clay, which often rests upon beds of yellow sand and

gravel. Though limestone is abundant, it is covered by materials that have been drifted from a distance, and the soil appears to be deficient in calcareous matter, and grasses do not thrive. The country has an exhausted look, though the remains of the Indian corn crops showed these had been pretty good. The country betwixt Baltimore and Washington is level, but poor and sandy.

Before I set out for the south, I remained upwards of a month in Washington; during which time I was occupied in studying the meteorology of North America. To Dr. Bache of the Coast Survey, Lieut. Maury of the National Observatory, Professor Espy, meteorologist to the Navy Department, and Professor Henry, secretary to the Smithsonian Institution, I am under the greatest obligations for the liberal manner in which they assisted me in my studies, and for their uniform kindness and attention.

CHAPTER IX.

WASHINGTON TO CHARLESTOWN.

January 4, 1855.—I set out this morning from Washington for the south. The Potomac was nearly cleared of ice, and the steamer landed us at Acquia Creek, from which we got the railway to Richmond, a distance of seventy-five miles. The country is generally level, though now and then somewhat undulating; and the soil is naturally poor. Some of the railway stations were of a loose sandy clay, in red and yellow beds. Pine is the predominating wood that covers the country; and where the forest had been recently cut down, the dwarf oak was springing up. The river margins were almost invariably occupied by oaks and other broad-leaved trees.

This would have been a much more valuable country if the soil had been suited to the growth of the beautiful Kentucky blue grass. The grasses which are natural to the soil are of the most worthless description, and their tall withered stems and leaves seemed to have been untouched by cattle in summer. Many of the fields which had been lying waste and growing coarse grass had recently been run over by fires. Wheat and maize were the principal crops, and the management of the land was indifferent. The properties seemed to be generally large. The farm buildings and long ranges of the cottages of the negroes, remind me of those of the Northumberland farms. The planters' houses were surrounded by oaks, ever-green cedars, and ornamental shrubs, and had a considerable air of antiquity about them. The system of cultivation that is followed seems to be in allowing the land to lie waste for some years and then subject it to culture. Owing to the

poverty of the soil, a small proportion of the country over which we rode to-day was under a regular course of cropping.

Richmond was at this time literally swarming with negroes, who were standing in crowds at the corners of the streets in different parts of the town. The most of the slaves who are hired out and who change masters, usually do so at Christmas. Many had not got places for themselves. The general system seems to be that the owners allow the slaves, male and female, to seek out masters for themselves. I went up and spoke to one man who was offering himself for hire as a coachman. He showed me a slip of paper on which was written, "Isaac, for hire, apply to Mr. —, 140 dollars per annum." According to his own account, he was not quite healthy, and would not be worth more than 700 dollars. I was rather amused at the efforts of a market gardener to hire a young woman as a domestic servant. The price that her owner put upon her services was not objected to by him, but they could not agree about other terms. The grand obstacle was, that she would not consent to work in the garden, even when she had nothing else to do. After taking an hour's walk in another part of the town, I again met the two at the old bargain. Stepping towards them, I now learned that she was pleading for other privileges—her friends and favourites must also be allowed to visit her. At length she agreed to go and visit her proposed home and see how things looked. It would thus seem that the feelings and wishes of the slaves are often humoured. There was nothing repulsive in the appearance of the crowds about the corners of the streets, as all were well-dressed and as light-hearted as one could possibly imagine.

I walked into a tobacco manufactory at Richmond, and one of the partners, an intelligent gentleman, showed me over the premises. About eighty hands were constantly employed, but none had yet returned to work since Christmas. A considerable time is always lost about this season, as the slaves cannot be readily collected to resume work. No women are employed, as the labour is heavy, and the slaves are all hired in, and their owners receive from 120 to 125 dollars a year;

but they have to supply clothing. Everything is done by piece-work, and the slaves usually work ten hours a day. Each earns for himself from two to five dollars a month, which enables him to obtain something more than the mere necessities of life. I was told that the negroes are easily managed in the tobacco manufactory, and the work could be done by them as cheaply as by free labour. In such establishments the negroes are all hired in, for were they to be bought it would require too much capital to carry on business. And besides, since none but able-bodied men are employed, the inconvenience of any other system would be great. The most of the tobacco raised in Virginia and manufactured at Richmond is for chewing. The manufacturing process consists in steeping it in vats and pressing it into cakes by screws turned by long levers.

I visited the cotton factories on the opposite bank of the James River, in which both free and slave labourers are employed. Slave labour does not appear to be succeeding well where it is applied to cotton spinning. As in the tobacco factory, the mill in which the slaves worked was still standing, for they had not yet returned from their Christmas holidays. There had been no stopping beyond a day among the whites, who were all busy; whereas the negroes had been out for nearly a fortnight. The manager complained of the negroes being difficult to regulate and keep in order. The average hire of the negro women was from thirty-five to fifty dollars a year, with board. The white girls got ten dollars a month. They were young, and their general appearance showed that their condition would compare unfavourably with the Lowell operatives engaged in the same branch of manufacture.

After leaving the cotton factory, I walked over a large farm in the alluvial land, lying south of the James River. I met the overseer on horseback, and found him willing to give me all the information that I desired. There were sixty negroes old and young on this farm, which was one of the largest in the neighbourhood. Out of this number, not more than 25 hands were available for work at this season. The allowance for an able-bodied negro was 4 lbs. of bacon and

20 lbs. of Indian corn meal a week, besides buttermilk. Twenty-two mules and eight oxen were required for cultivating 250 acres wheat, 140 Indian corn, 100 acres of oats. The produce of wheat is about 16 bushels to the acre, and of Indian corn, 40 bushels. The rotation of crops usually followed is—1st, Indian corn; 2d, wheat; 3d, clover; 4th, wheat; 5th, oats or pasture.

The whole force of the plantation was concentrated on one field of wheat stubble. The crop had been thrashed out in the field, and the negro women were carting the straw from large heaps and spreading it over the land for manure. The soil being somewhat stiff, the ploughs were drawn by four large mules—two negroes to each plough, one to hold the plough and the other to drive the animals. The operations were done in the most slovenly manner. The farm buildings were erected with wood in the English style, and few cattle were kept; and from the appearance of those that I saw in the yards, they seemed to fare poorly indeed. The management was far from being tidy, for immense quantities of straw and stalks of Indian corn lay scattered about; and the oddity of the whole was increased by numbers of negro children rolling about amongst the rubbish. The huts of the negroes looked old and shabby. The pastures were so thinly carpeted with grass, that the withered stalks of annual weeds imparted a barren aspect to the fields. The only redeeming object was the house of the proprietor situated on a rising ground, and nicely shaded by trees and shrubbery.

The alluvial soil along the south bank of the James River is not more than a third of a mile in breadth, but of good natural fertility. It consists of a rich argillaceous loam, having considerable resemblance to the Carse soils in Scotland. The small produce of wheat, however, in comparison to that of Indian corn shows that the climate is better adapted for the one than the other. Little or no tobacco is raised on these rich soils, as the plants grow large and coarse leaves, which are deficient in those qualities which constitute fine tobacco.

As already said, slave labour cannot be so economically applied in the culture of wheat and Indian corn as in tobacco.

The large surface over which the slaves must often be scattered in corn cultivation is not favourable to the division of labour, which the cultivation of tobacco admits of. The natural increase of negroes on this large farm would do little more than pay the wages of an intelligent overseer fit to manage such a farm. And unless a small proprietor give a corn plantation his constant superintendence, ruin must soon overtake him. Notwithstanding the large number of small proprietors who farm their own land in Virginia, the average size of farms in this State is nearly double to what it is in the New England States. The last census gives an average of 130 acres of improved land to each farm.

Virginia is nearly the size of England proper, but possesses only a small proportion of naturally fertile land. It is divided into the eastern and western districts. Out of a total area of upwards of thirty-nine millions of acres, little more than ten millions were improved in 1850.

The eastern is also called the tide-water district, as the tide runs up its rivers for about sixty miles, and the general level of the country does not average more than fifty feet above the level of the sea. The soil is derived from the tertiary formations, is generally poor, sandy, and easily exhausted. A good deal of tobacco is cultivated in this region, and the farms are of considerable size. Some of the best soils for the growth of tobacco, however, are situated betwixt the Alleghany Mountains and the tide-water district, and there the influence of tobacco soils in maintaining a large number of slaves is also exhibited. In 1850, the county of Louisa produced 1,584,285 pounds of tobacco, and the numbers of the slave and free population by the two last censuses were—

		1840.			1850.
Slaves	.	9,010	.	.	9,864
Free	.	6,417	.	.	6,827

On the other hand, a considerable part of the middle and western districts of Virginia is hilly, broken, and unsuited for slave labour. The following counties, in the

north-western part of the State, show an immense preponderance of free population—

		1840.	1850.
HANCOCK.....	{ Slaves.....	...	3
	{ Free.....	...	4,047
OHIO.....	{ Slaves	212	164
	{ Free.....	13,145	17,842
MARSHALL	{ Slaves.	46	49
	{ Free.....	6,891	10,089

In the eastern district the numbers of the free and of the slave population are nearly equal, whereas in the western those of the slave are only about one-seventh of the free population. The exact numbers in 1840 and 1850 were—

		1840.	1850.
EASTERN.....	{ Free.....	411,791	450,327
	{ Slaves.....	395,251	412,738
WESTERN.....	{ Free.....	379,108	562,564
	{ Slaves.....	53,737	63,234

The total number of slaves in 1850 was 472,528, or scarcely 3000 more than the number in 1830, as there was a decrease of 20,000 betwixt 1830 and 1840, but from some cause the numbers have been fully recovered by the last census. Perhaps, however, Virginia has now nearly her full complement of slaves. It is supposed that the natural increase of slaves in this State is about 5 per cent a year. Even to take the number at 3 per cent that have been sold or exported to Southern States, this gives 14,000 for the Virginia planters to dispose of, and at the moderate estimate of £140 each would amount to £1,960,000 sterling.

It is right to observe, however, that the larger part of the natural increase of the negroes in Virginia and Kentucky emigrate with the sons of the planters to the newly settled States. It requires a large estate, on which maize and wheat are the staple crops, to support fifty slaves. If a planter's son obtain eight or ten slaves, and emigrate with them to

the rich lands on the Mississippi, and cultivate cotton, he will, with ordinary attention and industry, soon accumulate a fortune. It is the emigration of the planter's sons which keeps up the great demand for slaves in Virginia and other States, which cannot employ many more slaves than at present.

The two principal agents in operation leading to the downfall of slavery, are the increase of the slaveholders and the increase of the slaves. Were it not the southern demand for the surplus labourers of Kentucky, Maryland, and Virginia, the institution of slavery could not exist many years in these States; for if no check were put to the natural increase of the negroes, their numbers would depress the value of property in the same manner as the poor-rates do in England. So long, therefore, as there is abundance of new land in the United States to carry off the surplus labour, slavery remains as profitable as ever it was, even in the culture of corn.

In the Free States, such as Massachusetts, admirable educational institutions exist, and are now spreading over the whole country. The inhabitants of Boston deserve great praise for the liberal manner in which they offer a free education to all. The educational system has had the happiest effects in raising the material comforts of the people. Even in those districts in the Slave States where slavery has little hold, the whites are poorly provided with schools, as it seems to exert an injurious influence on the enlightenment of the masses. Intelligence and wealth are concentrated in the large towns in the Free States; whilst they are scattered over the country in the Slave States among the large planters. The small farmers are neglected, or, perhaps, do not value the blessings of education. Mr. Howison, a native of Virginia, has drawn a sad picture of the condition of the poor whites in that State:—

“It is with pain that we are compelled to speak of the horrible cloud of ignorance that rests upon Virginia. In the eastern section there are 29,863, and in the western 28,924, over twenty years of age who cannot read or write. This, however, is not all. It is computed that there are in the State 166,000 children between seven and sixteen years of

age. Of these, about 28,000 poor children attend the free and Lancasterian schools, an average of twelve weeks in the year for each child. 12,000 more are sent to academies and classical schools. The remaining 126,000 attend no school at all, except what can be imparted by poor and ignorant parents. In the whole State of Massachusetts, containing, in 1840, 737,699 persons, there were but 4448 white persons over twenty years of age who could neither write nor read.*

Richmond is finely situated on the slope of the north bank of the James River. It has rather a stationary appearance, and none of the streets can be compared to those in towns of half the size in the Free States. Very revolting exhibitions are constantly taking place here in selling negroes for the south. With the exception of New Orleans, this is the greatest market for slaves in the United States. The numerous offices of agents or dealers lead us to reflect that there must be much laceration of feelings in the way in which families are broken up and separated. So long as slavery exists in Virginia, the exportation of the natural increase of the negroes will take place; for were it prohibited, the institution would be soon uprooted. As an example of the large inland traffic in slaves, it may be mentioned that one of the engineers on the North Carolina Railroad stated, that on one occasion he had taken 600 slaves south in one train.

January 6, 1855.—I took the railway cars from Richmond, at 3 P.M., for Wilmington, North Carolina, a distance of 248 miles, where we arrived next morning at 8 o'clock. As we proceeded southwards, the land gradually became poorer, until we reached the famous pine barrens, and there little cultivation is seen. The whole country is covered with the large-leaved pine, and the journey soon becomes monotonous. When we stopped during the night at the different stations, which were few and far between, a few splinters of the pine wood were held lighted in the hands of the negroes, and gave a blazing light which would have dimmed many gas burners.

* De Bow's "Industrial Resources of the South and West."

The soil of the pine barrens belongs chiefly to the post-tertiary formation, which extends along the coast from Virginia to the south of Florida, and also along the northern shore of the Gulf of Mexico, as far as the Mississippi. The breadth of this formation is about 130 miles on an average, and the soil of this immense area is of the poorest description, little of it being fit for cultivation. With the exception of the swamps and margins of the river, pines cover its whole extent, and furnish a considerable trade in timber, turpentine, resin, tar, and pitch.

A sort of rotation of trees takes place throughout the pine barrens. When the pines are cut down, the scrub oak commonly makes its appearance. This seemed to be invariably the case where the sand was white, and did not contain much vegetable matter; but where there was more, pines were usually replacing pines.

Wilmington is on the north bank of Cape Fear River, and has a population of 10,000, of whom upwards of 4000 are slaves. The houses are chiefly built of wood, and a little plot of garden ground surrounds the best of them. There is only one street paved, and the others are no better than the loose sand can make them. The numbers of mean negro huts, in some parts, are by no means a pleasing feature of the place. Nearly the whole trade of the town is derived from the produce of the pine forests. The wharves display immense quantities of pitch and resin barrels, and stills for the manufacture of turpentine are numerous. Pitch and turpentine afford an export trade of nearly one million sterling.

With the view of checking intemperance, the authorities have raised the licenses to fifty dollars. Heavy penalties are also incurred if any party is convicted of selling spirits to slaves under any circumstances. But I was informed by an Englishman who had been in the town for several years, that although the raising of the licenses had the effect of restricting the licensed houses to nine, yet upwards of fifty others sold spirits "on the wink." To test the matter, he would have me to go into one of the unlicensed to see how they managed matters; and by a few signs from him that seemed

to be well understood, the spirits were produced. Several fine houses over the town were pointed out, and I was assured that their owners had made their fortunes by selling "three-cent drinks" to the negroes. So these restrictive measures seem as nominal in their effects as they are in the north. While we stood in the shop, the conversation turned upon a murder that had been committed this morning. Colonel —, returning to town, had been shot in his gig; and from the light manner in which the subject was treated, similar occurrences did not seem to be at all rare. The fellow who told the story was lame, and it seems that he had come by this mishap not long ago, when in the act of stealing some vegetables from a garden, the owner of which had been so good a marksman, as to lodge a musket ball in his thigh. Two days after this, a gentleman informed me that, stopping for a day in the principal hotel in this town, he was present when a dispute arose betwixt two of the company, one of whom drew a pistol and fired at his opponent, and the ball grazing his shoulder, lodged in the wall. The number of deaths that annually take place in drunken brawls over the Southern States must be pretty large.

The general level of the country to the north of Wilmington is only about twenty feet above the river; and the sand in the surrounding country is as white as silver. To-day, for the first time, I saw the live, or evergreen oak, growing in the sandy soil. Some years, this tree bears great crops of acorns; in others, none at all. The "mast" years afford a plentiful supply of food for pigs; but they are uncertain. I took a long walk into the country to see the process by which the pitch is gathered from the trees. This has been a profitable branch of industry for a few years back, and some speculators have as many as fifty slaves in the woods engaged in it. The average size of the pines throughout the barrens is little more than a foot in diameter. The bark and about an inch of the wood are cut off from one side of the tree with an axe, about three feet from the ground. A hole is made below to receive the turpentine and resin as it exudes and flows down. A negro usually attends to 10,000 trees, and goes round and collects the liquid into

barrels. The surface of the wound is also scraped now and then; but what is thus got is inferior to that which is obtained in a liquid state. The one is called "scrape," the other "dip." In one part of the forest where the trees had been recently cut down, the scrub oak covered the ground entirely, and I only saw one specimen of the long-leaved pine springing up.

Cape Fear River is about 300 yards broad at Wilmington, with 25 feet of water in the channel. On the south side of the river there is a vast swamp, which, at one period, was under rice culture, but the embankments have been allowed to break down, and reeds cover the whole. The trees that grow in the swamp are of great size, almost all deciduous, and their branches are covered with grey moss, which hangs from them more than a yard in length. Crossing over the river, I took a walk for more than a mile along a road that had been made through the swamp. I saw only one field, of about 30 acres, that had been in rice last year. A number of negroes, men and women, were cleaning out the ditches, and digging over the land, which consisted of a rich vegetable mould. An intelligent negro told me that one man was able to manage five acres of rice—to dig the ground, sow the seed, water, hoe, reap, and thrash the crop.

As I was walking across the swamp I met a pine barren farmer, usually called a "cracker." He stated that he had three negroes, one of them was hired in at 154 dollars (£39 : 15 : 8) a year, but last year the same hand cost him 181, and some particularly good hands were still worth 200 dollars. The soil being so poor, the collecting of turpentine is the most profitable business in this part of the country. A good negro would collect 150 barrels of "dip" and 100 of "scrape" in a year. The first was worth three dollars a barrel, of 320 lbs. weight, and the last half that sum. Even if we allow 25 per cent for making barrels and transporting the produce to market, a large profit would still remain. This appeared to me by far too large a sum, but a highly respectable merchant in Savannah afterwards so far confirmed this statement by telling me that, in one instance, he had heard of 600 dollars a head having been realised on a

considerable number of negroes engaged in this business. Such profits cannot last long, but they show how valuable slave labour is still in many kinds of out-door employments.

This farmer mentioned that the soil of the pine barrens did not yield more than ten bushels of Indian corn to the acre, even when it was manured. I was rather surprised, however, when he told me that these dry barren sands would yield, with the same treatment, 20 bushels of rice. The rice crop requires a great deal more hand labour than the Indian corn, a circumstance which restricts its cultivation, although in going south I saw, on the pine barrens, a good many patches which had borne crops of rice. This farmer raised no more cotton than was required for the wants of his family, by whom it was manufactured into clothing.

As Wilmington had few attractions, I took the cars at 8 P.M., and reached Charleston, a distance of 283 miles, next afternoon at 3 P.M. Pine barrens nearly all the way, though we sometimes skirted along the edge of the older tertiary soils, consisting of a red sandy loam, with subsoil of red clay and beds of sand of the same colour. Large fields of cotton were passed, and the plants being killed down by the frost, they reminded me of hawthorn plants stripped of their leaves. The soil was naturally poor, impoverished by cotton crops, and extensive tracts were lying waste in coarse grass, whilst here and there the pine and the dwarf oak were making their appearance. A few neat planters' houses were seen in the distance, surrounded by the white-washed huts of the negroes. But the most of the dwellings of the negroes, as well as the poor whites, were very mean, and usually without glass in the windows.

The railway runs for six or eight miles through a part of Little Dismal Swamp. It is carried on piles, and raised about eight feet above the surface. In the swamp are large deciduous trees, now quite bare of foliage, and in many parts the water covered the surface from two to three feet in depth. Prostrate trunks also lay in the water, in all stages of decay; and where the surface was somewhat dry, there was a thick undergrowth of cane and evergreen shrubs.

A great change had now taken place in the temperature.

Yesterday the weather was hot and bright at Wilmington, and the southerly wind felt quite balmy. After sunset the ladies were sitting at the open windows of the hotel. To-day, at sunrise, the thermometer stood at 66°, with a clear sky, the windows of the carriages were thrown open, the breeze being delightful. At Charleston I found my old enemies, the mosquitoes, in my bed-room, and they sung and stung all night.

Arriving at Charleston on Sunday afternoon, I had an opportunity of seeing the coloured population coming out of church. They were well dressed, and few of the women had any of those gaudy coloured articles of clothing that impart a comical appearance to the slaves when fully rigged out in such fantastic costume. The town, like many others in the south, is not advancing much in wealth or population. Things wear a settled aspect, and the houses of the wealthy classes have an aristocratic air about them. There is much refined and delightful society in the town, and I always look back upon my visit to Charleston with agreeable reminiscences.

While in Charleston Library one day, I heard of a sale of slaves having taken place on one of the cotton plantations. The average price, old and young, was 400 dollars, but two months ago it would have been as high as 600. This fall in slave property arose from the tightness in the money market. I also overheard two gentlemen in the room discussing the propriety of opening the slave trade—a course which had been openly advocated by some worthies in New Orleans. One made the remark that the south now paid little regard to what England might think of the matter. This conversation, I must confess, had a curious effect upon me, for I was somewhat mortified to find how little impression all that has been said and written about slavery has had on those whose pecuniary interests are interwoven with the institution. At first I could hardly believe that the conversation was real, but other circumstances soon convinced me that I was now breathing the atmosphere of slavery.

The chief exports of Charleston are cotton, rice, and lumber. The greater part of the business being transacted

in winter, the wharves were covered with bales of cotton, and the harbour crowded with ships. A large influx of merchants and labourers takes place in winter, but they again depart during the hot season. For a long period Charleston exported more cotton than any city in the Union, but it is now exceeded both by New Orleans and Mobile. The extension of railways into the interior has had the effect of only slightly increasing the quantity of cotton shipped at this port. The total quantity exported in 1851 amounted to 409,683 bales, of which 15,000 were of the sea-island or long staple variety, the rest being the short staple or upland variety.

It would farther seem that South Carolina cannot materially increase the number of bales of cotton, for land capable of growing cotton is limited. The sea-island variety is not cultivated at a greater distance than 30 miles from the sea, and the greater part of it within 10 miles. For upwards of 100 miles from the coast, the country consists of pine barrens and swamps. The pine barrens occupy 6,000,000 acres of land, which is of the poorest description, and cannot be cultivated by slave labour. The inland swamps occupy at least 1,200,000 acres, which are wholly unproductive. It is seen by the map that the upland cotton is raised on a belt intervening between the pine barrens and the hilly country, at the base of Blue Ridge Mountains. These upland cotton soils were naturally moderately fertile, but somewhat easily exhausted and difficult to ameliorate. Their peculiar character will be afterwards described. The exhaustion of the soils in the uplands, where the greater part of the cotton crop is raised, forces the owners of slaves to go farther westward, so that there is not a great increase in the number of slaves, and the amount of produce is also rather declining.

The low islands along the coasts of Carolina and Georgia, with a margin of about thirty miles from the sea, furnish the finest quality of cotton raised in any part of the world. In this comparatively limited area, the climate produces a length, strength, and firmness of fibre which cannot be obtained by art in other localities. The northern limit of the sea-island cotton is about the 33d degree of latitude, and recent trials are favourable to the extension of its culture along the Flo-

rida coast. Whilst the price of the upland varies from 7 to 10 cents a pound, the sea-island, or long-staple, varies from 15 to 70 cents, and thus a fine quality of the latter affords considerable encouragement to careful culture. The soil, however, upon which this high-priced variety grows, is poor, consisting, for the most part, of a light sand, which is only kept under cultivation by liberal dressings of salt-marsh mud.

During the time I remained in this neighbourhood, I had several invitations from the cotton planters to visit their estates. I found, however, that my time would only permit me to inspect one of them. I was surprised to learn that the soil of the plantation which I visited was a pretty fair specimen of the quality of the soils upon which the long staple cotton is raised. It consisted of a light sandy soil, containing little vegetable matter; and with the exception of some live oaks at the negro quarters, there were no other trees but pines to be seen. The fields, which had been lying waste for some time, were overgrown with coarse grasses that were now dead and withered. Though the temperature in the afternoon was as high as 68° in the shade, the white clover was just beginning to show signs of vegetation.

Engagements preventing the gentleman to whom the estate belonged accompanying me, I was directed to ask for his "driver," named "Jupiter," whom I found a most intelligent person. He was of pure African blood, and possessed a powerful frame, with a great deal of energy and activity in his character. The management of the plantation was almost entirely confided to him. There were twenty-one negroes, old and young, on the estate; but there were fourteen working hands; and forty acres had been in cotton this year, but last year only thirty acres. This seems scarcely three acres to the hand, though he assured me many managed five acres. The cotton is planted in ridges $4\frac{1}{2}$ feet in width, and a foot and a half between each plant in the row; but if the soil is rich, as much sometimes as three feet. The cotton seed is planted from the 20th March to the 20th April; and as the plants rise, the soil is thrown up to their roots by the plough and the hoe. The seeds of the cotton plant, like those of peas or beans, ripen soonest on the branches next the

ground ; indeed, while the lower branches of the cotton plant have ripe seeds the upper are bearing flowers. As the seeds ripen, the husks expand, and the cotton fibre appears attached to the seeds in the form of a round ball as large as an orange. As soon as the earliest husks are open, which is usually about the last of July, picking commences. This operation is long continued, for a succession of pods ripen until the end of November. As the cotton is gathered, it is dried and stored up till winter, when the separation of the fibre from the seed is effected.

The soil being so poor upon which the sea-island cotton is raised, the most of it is manured with a compost of cow-pen manure and vegetable stuff from the swamps. Guano has also been applied to a considerable extent in raising cotton. I saw one field which must have been greatly benefited by a quantity of this substance, as the plants to which it had been applied were nearly double the size of those that were undressed. Guano, however, is more esteemed as a manure for cotton on poor soils than on rich, for on the latter it is apt to send up too much wood.

In climates in which frosts do not occur, all the varieties of cotton that are cultivated in the United States are perennial. But here the plants are always killed down by the frosts, and the woody stems are now dead. The roots, however, were still fresh, and sending out some buds a little below the surface of the ground. Jupiter assured me that a small crop of cotton might be got from the same plants next year if they were allowed to stand, but as the quality of the fibre was also inferior, this practice was rarely followed.

Besides the cotton, about twenty acres of Indian corn and some pease were cultivated. The Indian corn is planted from the 1st March up to the 10th May, and the rotation on the farm was—1st, cotton ; 2d, Indian corn ; 3d, cotton ; 4th, grasses and weeds for a series of years. There were 250 acres which could be ploughed, so that less than a sixth of the improved land was under cotton. The peas were planted in rows three feet apart ; and sixteen peas are dropped into holes at intervals of sixteen inches in the row. This plan seems to be adopted in order to render the crop more easily

kept free from weeds. Two crops of peas can be got from the same ground in one year—the first is planted in April and picked in July, and another immediately sown, which ripens in October. When peas are sown in April, they have usually a great tendency to produce too much straw, and to fall down and cover the whole space; but when sown in the end of June, they run up at once and bear seed. The produce is seldom more than 15 bushels to the acre.

Great care is bestowed in preparing the fibre of the long-staple variety for market. The first process consists in sorting the cotton, or taking out all the seeds that are not of a pure white colour. An old hand has 100 lbs. given out as task-work in sorting. The next process is that of separating the fibre from the seed by the treadle-gin, which is still used for the long-staple variety, for Whitney's saw-gin is only used for the short staple. From 25 to 30 lbs. is the common day's task for a negro woman. The gin is driven by the foot, and two small wooden rollers, about an inch and a half in diameter, closely pressed together, draw in the cotton fibre and leave the seeds behind, which fall down as soon as separated from the wool. After this it is carefully hand-picked to remove any pieces of husk or seed. This is called "motting," and 30 lbs. is the quantity done in a day. At this season, the negroes commence work by six o'clock; and taking an hour at dinner, usually complete their task by four o'clock in the afternoon. No one was working on the plantation when I arrived at five o'clock. About 160 lbs. of cotton ready for market are usually got to the acre on this plantation. The negroes receive 4 lbs. of bacon, and 6 quarts of corn meal, and one quart of molasses a week, and Jupiter was allowed double rations.

The cotton crop on the sea islands is very precarious. Two or three weeks of showery weather frequently occur during the picking season, and the seed is often shed out and the produce diminished. The common opinion seemed to be, that the average produce of clean cotton of the sea-island variety is not more than 150 lbs. to the acre. On the sea islands and along the coast, the produce is kept up by manuring the soil with salt-marsh mud, which seems to be the best application for obtaining quantity and quality.

On the whole, the quantity of sea-island cotton is not increasing, owing to the natural poverty of the soil and the limited region over which it can be cultivated. Latterly, some planters have been improving the salt-tide swamps along the mouths of the rivers, and raising large crops of cotton. Rich land, however, is not so favourable to the production of the finest fibre, for if the plant is stimulated beyond a certain degree, the wool becomes inferior.

I heard many complaints of the unprofitable nature of sea-island cotton, and some were maintaining that in general the money invested would not pay legal interest. In consequence of the poor nature of the soil, as well as the attention required to select the finer kinds of seed, I could easily imagine that the cultivation of this crop would seldom be successful when left to overseers. But the high prices that are got for the finest qualities, offer considerable inducements to painstaking management, far more so than on the more fertile soils of the uplands, on which the crops are larger; but the quality of the wool, or fibre, does not vary to the extent it does on the sea islands. I heard, however, of a sea-island planter who had lately died and left an estate worth £12,000 sterling a year. Beginning the world with little, he had amassed this fortune by raising sea-island cotton. He had acted on the principle of growing all the provisions which he required on his plantations, and having a little of every kind of crop for which the soil and climate was suited. The majority of the cotton planters buy in the greater part of the Indian corn which they require for their negroes, as well as all the bacon. In all probability the prevalence of this practice of buying in the most of the provisions, arises from the system of managing by overseers, which frequently leads the owners of estates to aim at producing a large number of bales of cotton, when the net produce might be greater by a different system of management. The quantity of sea-island cotton raised in the United States is only about 35,000 bales of 400 lbs. each; and as the produce is not supposed to be more than 150 pounds to the acre, this would give about 100,000 acres as the extent of land devoted to this kind of cotton.

CHAPTER X.

RICE CULTURE.

HAVING several introductions to the rice and cotton planters in the neighbourhood of Savannah, I left Charleston for that town on the afternoon of the 11th of January 1855, in one of the mail steamers, which usually make the passage in ten hours. Before the sun set I had a view of some of the "sea islands," upon which a portion of the famous long-staple cotton is raised. Their surface is only elevated a few feet above tide, and in general the soil is light and sandy. Where the land is uncleared, pines are the predominating trees of the forest. The weather was close and foggy next morning as we sailed up the Savannah; but as we reached the wharf the sun broke through, and the air felt mild and genial. Many were considering it too warm for the season; for the thermometer was 68° in the shade in the afternoon.

Savannah is about eighteen miles from the sea, and situated on the south or right bank of the river of the same name. It is built on the sandy soil of the pine barrens, and is about forty feet above the level of the river. Its situation is dry and airy; but, in consequence of the immense extent of rice ground to the northward and westward, it is very insalubrious in summer. Malignant fevers then frequently decimate the white population, more especially those who are not acclimated.

The exports are cotton, rice, lumber, and a small quantity of sugar. Though the exports of cotton are nearly as large as those of Charleston, and a great amount of commerce is carried on, there is much less appearance of a wealthy class of residents. The population by the last census was only 23,000 souls, of whom upwards of 9000 were slaves. So

large a number of the population being slaves, whose condition is nearly stationary, and inferior to that of the free labourers who have all their own earnings at their disposal, the town has not the vigorous aspect of the towns in the Northern States. There has been no want of taste in laying it out. The streets are wide, and there are numerous squares planted with the live or evergreen oak and the pride-of-India tree. The thoroughfares, however, are unpaved, and vehicles of all kinds move about, almost unheard, over the soft sand. The houses of the wealthy classes are situated on the south side, at a considerable distance from the river. Camellias in flower were quite common in the gardens; there were also a few small orange trees, which were far from being vigorous; and the finest street was in close proximity to the sombre pine forest. There appeared so little traffic towards the sterile interior, that the town had the appearance of being a stranger in the wilderness.

There is so much uniformity in the geological structure of Georgia and the Carolinas, that a description of the physical aspects of the country on both sides of the Savannah will suffice for that of all the other rivers in these States. At the mouth of the Savannah the coast is low and sandy. It belongs to the post-pliocene formations, and forms a part of that immense tract of sandy soil, well known under the name of the "Pine Barrens," which, as already stated, fringes the North American continent from Southern Virginia to the banks of the Mississippi, a distance of about 1700 miles. Its breadth is about one hundred miles in South Carolina, and it is almost wholly covered with pines. Along the coast it is only a few feet above the level of the sea; but it gradually rises towards the Blue Ridge Mountains. A belt of tertiary formation succeeds, consisting of sands and clays, upon which the upland or short-stapled cotton is raised. This, in turn, is succeeded by soils derived from the primary rocks of the mountain range. Considerable quantities of cotton are also raised on these primary soils, which, unlike those derived from the same class of rocks in any part of the British islands, are in many instances of considerable depth, and derived from the decomposition of gneiss and mica-schist *in*

situ. Indeed, the tertiary and the primary soils have often so much resemblance in lithological characters, that, to distinguish them, they must be examined with care. Where the land of the primary rocks becomes elevated, the culture of cotton gives place to that of Indian corn and wheat.

The Savannah is navigable as far up as Augusta, which is 250 miles by the river from the sea. The tertiary soils extend as far as Augusta, where the primary formation begins. This formation forms the terminus to the navigation of the most of the other large rivers which drain the Atlantic slope, because their beds then become hard and rocky, whereas throughout the tertiary formations they have excavated deep channels out of the softer materials of which the country is composed, and flow to the sea with a fall of a few inches to the mile. At the mouth of the Savannah and all the other rivers of the South-eastern States, the country beyond the tide-swamps is low and sandy; but as one sails into the interior, the banks or "bluffs," covered with pines, become higher.

At Savannah, the river, at low water, is confined within a channel of 300 yards in breadth, and is about thirty feet in depth. At high water, before the country was settled, the rich alluvial land which now forms rice-grounds, was covered twice a day by the tides, and was thus a vast swamp. The trees on the rich swamp-lands throughout the Southern States are of great size, but are almost all deciduous, consisting principally of tupelo gum, ash, and cypress; the undergrowth is cane and various vines. The swamps which now form the rice grounds were reclaimed by erecting embankments along the sides of the river and preventing the overflow of the tides.



The above sketch will give a more correct idea of the country four miles above Savannah than any written descrip-

tion. The sandy bluffs on both sides are about forty feet above the water, and the rice grounds extend for more than three miles from the channel of the river towards the northern bluff. It happens that there are no rice grounds on the south side for several miles above the town.

In Georgia and the Carolinas there are a good many marshy grounds in the pine region, which have arisen from beds of clay sending the water to the surface in springs. They are composed of black vegetable matter, too deficient in earthy materials to be possessed of fertility of any great permanence. It was on such soils, however, that the first settlers raised rice; but being easily exhausted, recourse had constantly to be made to new land. Though a considerable quantity of rice is here and there raised over the upper country on such soils, and even on the dry cotton lands, for domestic use, none of it is reckoned sufficiently good for exportation. The discovery that the tide-water swamps are peculiarly well adapted for the culture of rice is comparatively recent. At first, the barren sandy soils were more valued than they are now, because indigo was raised upon them, and was one of the great staples of the country. This article can now be brought to the European market at a cheaper rate from our possessions in India, and its culture has therefore been abandoned in the United States. A revolution has thus taken place in the relative values of the swamp grounds and the dry pine lands. The value of the latter is at present merely nominal; while good rice grounds are worth more than any other land in the country. The common price of rice grounds in the neighbourhood of Savannah is £30 per acre, and some on the Cooper River were sold at £40. These prices are more than double those of the best sugar lands on the Mississippi.

It is on the tide-water swamps of the Savannah, and the numerous other rivers in Georgia and the Carolinas, that the fine rice known in Europe as the Carolina rice is cultivated. The production of rice for exportation is, in a great measure, confined to these swamps; and it is further limited to the fresh-water-tide swamps; for where the tides are salt, or even brackish, they are unsuitable for irrigation. Rice is

cultivated about four miles below, and twelve miles above Savannah.

When one stands on the top of the steep bluff at Savannah, a view is got of the vast swamp which stretches to the westward and northward. In some parts of the rice grounds magnificent trees are seen, now bare and destitute of leaves, but covered with grey moss, hanging like drapery from every branch. With the exception of some live oaks, and also a few cabbage palm-trees, which remind one that he is approaching the tropics, the general mass of vegetation, notwithstanding the warmth of the weather, looked as dead as it does here in December.

Both below and above the town, I visited some plantations, which are generally large on this river, though varying from 200 to upwards of 1000 acres in rice crop. From the nature of the works which are required to reclaim the tide-swamps and render them fit for cultivation, large capitals are invested. Rice thus can only be cultivated on the large-farm system, and where labour can be commanded. In some districts where rice-culture was early introduced, the plantations have been greatly diminished in size by the division of property among families. On the Black River, in South Carolina, some of the plantations are as small as sixty acres ; but this extent is found to be about the minimum size on which profitable culture can be carried. When such small estates come into the market, they are almost invariably bought by adjoining proprietors, and thus there is a tendency to larger properties being again formed.

I spent a day riding over the rice plantations about four miles above Savannah, in company with several large proprietors. Keeping out of view the miserably tame scenery on the banks of the Savannah, the river itself bears a considerable resemblance to the Tay at Newburgh, in Fifeshire. Reeds were growing in the rich alluvial soil flooded by the tides, and the embankments raised to protect the rice grounds are, in every respect, similar to the dikes which protect the wheat-fields of Parkhill, or of Mugdrum Inch. After crossing the river in a boat, and mounting a pony on the bank, the low and level lands, stretching to the west and east

as far as the eye could reach, and more than three miles to the sandy high grounds, gave me at once an idea of the vast extent of land which had been rescued from the tides and rendered so productive.

The soil of the rice-grounds, for more than a mile from the river, is fertile, consisting of a strong clay, rich in vegetable matter. Towards the high grounds it is more peaty, in consequence of the earthy matter brought down by the river having been mostly deposited near its channel by the swamp-growth acting as a sort of filter. From the want of the earthy matter, this is a poor soil—just as much so as our own peat-mosses are before being improved by clay or sand.

Main canals, having sluices on their mouths, are dug from the river to the interior about 20 feet in width; and as they sometimes extend across the whole breadth of the swamp, are more than 3 miles in length. The rice-plantations are subdivided into fields of about 20 acres each. The fields have embankments raised around them, with sluices communicating with the main canal, so that they may be laid dry or under water separately, according as it may be required. Numbers of open ditches are also dug over the grounds, for the purpose of allowing the water to be more easily put on or drawn off.

Considerable diversity prevails in the mode of cultivating the rice crop. Some planters plough all the grounds every year. Those who follow this system give a light furrow in the beginning of January, and afterwards make shallow furrows or drills 15 inches apart to receive the seed, which is sown broadcast, in the month of April, at the rate of from two to three bushels per acre. A small quantity of water is then admitted for a day or two, until the grain sprouts.

The plough used on these rather strong soils is exceedingly light, and drawn by a mule. I have seen a negro woman carrying one on her shoulder from one field to another. On a plantation of 500 acres under rice, I found that 22 mules performed the whole ploughing, besides cultivating from 70 to 80 acres of Indian corn on the light sandy soils of the pine country. No one can say that there is any waste of animal power in this case. Rice-culture involves a large

amount of manual labour, for about 100 negroes, men and women, are required to tend and reap the crop on this extent of land, and take the grain to market. This number of field hands was only got out of 250 negroes, young and old. The common calculation is, that the working hands are about one-half of the total number of negroes on a plantation.

The most approved and general mode of cultivating the rice-fields, when free from weeds, is to sow the seed without ploughing. The stubble of the previous crop is burned over in spring, which operation is easily effected, owing to the quantity that is left at harvest. A negro then goes into the fields, and makes a rut with a hoe between the rice rows of the former crop. Sometimes a small drill-plough is used. Either of these serves as a receptacle for the seed, which is either covered with a rake, or the water is admitted at once, and covers it by washing down the soil.

The water, in all cases, is admitted to the fields as soon as the seed is sown; and when the young shoot appears above ground, it is again drawn off. In the course of a week the crop usually receives another watering, which lasts from 10 to 30 days, according to the progress which vegetation makes. This watering is chiefly useful for killing the land-weeds that make their appearance as soon as the ground becomes dry. On the other hand, when the field is under water, aquatic weeds in their turn grow up rapidly, and, to check their growth, the field is once more laid dry, and the crop is then twice hand-hoed. By the 1st of July the rice is well advanced, and water is again admitted and allowed to remain on the fields until the crop is ripe. This usually takes place from the 1st to the 10th September. The water is drawn off the day previous to the commencement of reaping. The rice is cut by the sickle, and the stubble is left from a foot to a foot and a half in length, according to the rankness of the crop. The day after it is cut it is bound into sheaves and carried by the negroes to the bank of the main canal, whence it is carried in flat-bottomed boats to the threshing-machine. The rice in the husk is then sent to Savannah in boats.

Such is a general outline of the method followed in

the culture of rice: the particulars are varied, according to many circumstances which arise. So far as I had an opportunity of judging, I thought that the planters displayed much skill in the management of their estates. The most of the rice-planters are highly educated men, fully alive to every improvement, and give close attention to the management of their properties during winter, spring, and the early part of the summer, when the climate is particularly healthy.

The average produce of rough or unhusked rice on the Savannah swamps is estimated at from 45 to 55 bushels to the acre. Though the fields have been long under cropping, the produce is still large, but no doubt smaller than when the land was first cleared; still from 70 to 80 bushels are sometimes got on old cultivated fields. Crops of rice are usually taken in succession as long as the land is clean; but when it becomes foul through weeds, or the "volunteer rice," it is laid under dry cultivation for a year. This is attended with great benefit; for although no manure is applied, and two crops—one of oats and another of potatoes—are taken, yet the land is so much renovated that the succeeding crop of rice is often increased by a half, and sometimes even doubled. The oats are sown in the beginning of January, and the surface of the ground is merely scratched with a hoe to cover them. The warmth and moisture of April and May commonly send up a thick and tall crop, which almost smothers the grass and the "volunteer rice," and which is ready to be harvested by the end of May. As soon as the land is cleared of this crop, stems of the sweet potato are planted in five feet rows, and during the growth of the potatoes the intervals are thoroughly cultivated by the hoe and the plough. The manner in which the sweet potato-crop is managed is this:—The roots are planted in March or April on dry pine-barren soils that have been well manured. An immense mass of stems grows up in this climate under such treatment. The stems are cut off and transplanted in the rice-fields, and one acre of them serves to plant twenty. And what is singular, the crop from which the stems are cut, is by this process rendered more abundant. This arises apparently from the crop being

forced to grow throughout the warm season, and its perennial tendencies being so far developed.

The "volunteer rice," which is interesting in a physiological point of view, causes a great deal of trouble to the planters. The rice-seeds that are shed when the crop is cut, and lie over the winter, produce an inferior quality of grain, for under these conditions they appear so far to revert to their natural state. Though the husk of the "volunteer rice" is of the same light-yellow colour as that of the finest quality, the kernel is red, and a few grains of this kind in a sample detract from its market value. There are several varieties of "volunteer rice," which are usually the most vigorous plants in the field; and as some of them ripen before the main crop, they fall out and increase with great rapidity.

The rice plant adapts itself in a most wonderful manner to the most opposite conditions in respect to moisture. There is no cultivated plant that bears any resemblance to it. The same variety which grows on the upland cotton-soils and on the dry pine-barrens, grows in the tide-swamps, where the land is laid under water for weeks at a time; and even in the lower part of the delta of the Mississippi, where the fields are under water from the time of sowing to that of reaping.

Rice straw, on the dry upland soils, ripens along with the grain, as is the case with our cereals; and the stubble dies at once. Many, however, must have observed, that the ears of oats and barley that grow on damp peaty soils ripen long before the straw, and the stubble often retains a certain amount of vitality and freshness for some time after the crop is cut. But in the irrigated tide-swamps the vitality of the rice plant is prolonged to a most wonderful extent by the system to which it is subjected. When rice is ready for harvesting, and all the grains in the ear are quite hard with the exception of a few of the lower pickles, the stem and leaves remain perfectly green. The rice grows from $3\frac{1}{2}$ to 5 feet in height, and, as already said, considerably more than a foot of stubble is left. No sooner is the crop cut than the stubble sends out shoots and leaves from its *top-joints*, and in some

instances it has produced as many as thirty bushels of rice per acre as a second crop from the same sowing. This is a curious fact, and one that does not seem to be generally known, for on going to New Orleans, Dr. Barton called my attention to a communication by a French writer who had discovered a method in Egypt by which two crops of rice might be got from one sowing. The plan was not made known, but I told him that I thought it could be no other than that which was well known to the Carolina planters. The autumn frosts, however, generally cut down the second growth before the grain has time to ripen. But every season, after harvest, a considerable growth of stems and leaves takes place, when the rice-fields are represented as assuming the appearance of having a second summer. The leaves and stems are killed by the first night's frost, affording a large quantity of withered vegetable matter in spring, and thus readily permit the fields to be fired during a dry period, and cleared and fitted for being once more scratched with the hoe, and sown with rice.

It is readily seen that large capitals are necessary in the culture of rice on the tidal swamps. A great expenditure of labour is constantly required to maintain the banks in good order, to clear out the drains and canals, as well as to keep the sluices and valves in repair. It would be far from satisfactory to give any detailed estimate of the expenses and profits of rice culture. The fact, however, of the rice-grounds being of greater value than land devoted to any other crop, is quite sufficient to attest the profitable nature of rice culture. Nor is this to be wondered at when it is considered that land capable of raising rice with advantage is comparatively limited, and has been almost entirely occupied for a considerable time. This is the reason why the exports of rice from the Southern States have not been increasing for many years. The demand for rice in America far exceeds its supply as a common article of food, for it is but a small portion of land upon which it can be profitably raised. The slaves on the rice and cotton plantations are supplied with Indian corn instead of rice. The latter is used more as an article of luxury, for it is far higher priced than Indian corn. In the tropical parts of the British possessions in India, where

the cultivated land is all irrigated, rice is the cheapest article of food, as it is by far the most productive grain-crop in low latitudes.

From the conversations that I had with the planters in the neighbourhood of Savannah, I became fully persuaded that Indian corn is much less prolific in the Southern States than in the Northern. I afterwards found this amply confirmed by the planters in the delta of the Mississippi. The produce of Indian corn, on the rich alluvial lands of Georgia or of Louisiana, is less than the half of what it is on soils of the same fertility in Northern Kentucky. The moister atmosphere and higher temperature of the South develop a great growth of stems, while the produce of grain is comparatively small. This is perhaps the chief cause of the planters in the cotton districts importing so large a quantity of this grain from the Northern States. Considerable quantities of rice are raised throughout the cotton-region in dry culture; and though the produce varies much in different years, it is probably greater than that of Indian corn in the average of seasons. For as I stated in last chapter, one of the "crackers," or small farmers, who cultivate the poorest pine-barren lands, assured me that he did not raise more than ten bushels per acre of Indian corn, though the land was manured; whereas with the same treatment, twenty bushels of rice would be reaped.

The objection to the culture of rice on the dry upland soils arises from the greater amount of manual labour which is required to keep the crop free from weeds. The lengthened period of hot weather over which its growth is extended, and particularly the circumstance of this crop, like our cereals, being sown either broadcast or in narrow drills, which do not admit of horse-hoeing, tend to give great encouragement to weeds, so that its culture demands too much hand-labour to be generally profitable. Rice also requires more labour to prepare it for food; and hence, although forty bushels of rough rice are often got on the cotton-lands of the uplands that rely for a supply of moisture on the summer rains, the more easily tended Indian corn is the great staple, even in the Southern States, where it is less productive than in the North.

The very successful culture of rice on the tidal swamps has much to do with the economy in the amount of labour required to raise the crop, through the extraordinary manner in which the rice-plant can withstand the extremes of being laid dry or under water at intervals—a process which materially serves to destroy both the land and water weeds.

The rice-grounds are comparatively healthy to white men in winter, but not so in summer and autumn, when the crops are growing and ripening. It has been often remarked, that the swamps, in their original state, along the Southern rivers of the United States, were by no means so deleterious to the whites as they are now, when brought under cultivation. Though this seems to apply, in a certain degree, to all the rich alluvial soils in the river bottoms, yet it is particularly applicable to the rice-grounds that are irrigated by the tides. Indeed, the undrained swamps remain comparatively healthy so long as they are covered with the natural vegetation. It is said to be attended with extreme danger to a white man to remain, during the hot season, for one night on the rice-grounds of Carolina. The planters, with their families, invariably leave the rice-grounds during the hot season, and remain in a more healthy part of the country until the crops are harvested.

Though the negroes are not liable to those diseases which are so fatal to the white inhabitants in summer, yet they do not increase in the rice districts. In fact, according to all accounts, it requires good management on the part of the planters to keep up their numbers, so as to do away with the necessity of going into the market to buy. This circumstance alone is a great drawback in the profits of rice culture, for on the cotton plantations, with ordinary care, there is a constant increase in numbers. The damp ground and the nature of the labour render the negroes liable to pulmonary diseases. The children, also, are particularly subject to measles and hooping-cough, which often prove fatal. One planter informed me that he now sends all the children born on the rice plantations to his cotton estates in the interior. Out of sixty children he had only lost four, and experience convinced him that the loss would have been at least four times greater had they remained on the rice-grounds.

So far as I could learn, I have every reason to believe that the negroes on the rice-plantations have a liberal supply of food and clothing. About half a pound of bacon a-day is the usual allowance for an able-bodied negro, with Indian-corn meal and molasses. They have the privilege of keeping pigs and poultry of their own, which they sell, and are thus enabled to buy tobacco, tea, and other groceries. A planter one day pointed out an old negro to me, who had not done any work for ten years, but who had got his rations regularly with the others, and a few days before this he had sold two pigs for thirty dollars.

The cost of providing the negroes, old and young, with food and clothing, is from 30 to 40 dollars a-head. The value of slave property has been gradually rising for several years; but a slight reaction had taken place about the time of my visit, owing to the pressure in the money market. At the present time, the negroes in the rice plantations are worth upwards of *one hundred pounds* (500 dollars) all round; some sales had been made as high as *one hundred and fifty* (750 dollars). Good field-hands bring considerably above 1000 dollars. Negroes were not worth much more than fifty pounds (250 dollars) twenty-five years ago.

The discipline maintained on all the plantations is almost as strict as that of our military system; and so long as slavery exists, a certain amount of firmness seems quite necessary for maintaining due regularity and authority. As we rode over the rice-grounds above Savannah, we came up to a gang of more than twenty negro men clearing out one of the main canals. They were up to the middle in water, and were throwing out a soft mud upon the bank along which we rode. Here for the first time I saw the black "driver," with a long whip tied round his shoulders, superintending his brethren, who worked as methodically as machines. I believe, if they had got no orders to desist from their occupation till we passed, that we should have been bespattered with mud. A loud shout from the "driver" brought the whole to a stand, and we were then subjected to their vacant and complacent stare. In other parts of the ground the women were working with the spade and mattock in

repairing the banks — all being well clothed and provided against the changes of the winter climate.

Before going to the south, I had been led to believe that the planters were sensitive on the subject of slavery, and that I should avoid the topic in conversation. But I soon found that they had no such feeling in the matter : with some of the Cuban planters it was different, for I came to understand that the physical condition of their slaves, and their treatment, were, as matters of etiquette, not to be alluded to. On the contrary, a large proprietor of rice-grounds on the Savannah told me “to go and inquire into the moral and physical condition of their negroes, with as much freedom as I would among the agricultural labourers in Lothian or Berwickshire, and to go home by Jamaica, and make a comparison between the emancipated negroes and their own slaves.”

At Savannah, on the $32^{\circ} 05'$ parallel of latitude, some specimens of the animal kingdom, as well as of the vegetable, are found, which indicate that the tropics are not far distant. The alligator is often seen in summer in the river, but it buries itself in the mud during the cold season. Several species of turtles are to be found ; and a small terrapin, so much esteemed for making soup, disappeared into the canal of the rice-grounds one day as I rode along the banks. The large turkey-buzzards which belong to the vulture order were wheeling over the fields in quest of prey in all directions—at the quarters of the negroes, we set up a large flock of these birds, which had congregated around some carcass. Being seldom molested, they are very tame, and sat quite close to us ; they even frequent the streets of Charleston during the day, and pick up all kinds of carrion. The American rook, very like our own, but having a much more sonorous croak, was making himself heard in the leafless swamp-forest. The sky being without a cloud, and scarcely a breath of air stirring, the weather felt rather too warm for riding.

A great disaster befell the rice crop of 1854 on several of the tide-swamps of Georgia and Carolina. One of the most violent hurricanes that has occurred this century happened on the 8th September 1854, when some of the crop was cut down, and the most of it nearly ripe. High tide occurred at

the same moment that the easterly wind was blowing with its greatest fury, and the salt water of the sea was driven up the river far beyond its usual limit, and, rising above the level of the rice-ground embankments, deluged the fields. More than three-fourths of the rice on the Savannah swamps was thus destroyed. As I rode over the grounds, I saw evidence of the great loss of property which had taken place. In some of the corners of the fields the rice in the straw lay over the ground from three to four feet in depth. Some of the grain did not appear to be greatly injured; but as the medical men had given their opinion that it was not fit for food either to man or to beast, it was piled into heaps to be burned. Such accidents seldom occur, and no efforts are made to guard against them, as it is deemed almost impracticable to do so.

Attention may now be directed to the effect of rice-culture on the relative numbers of the free and slave population. The rice-grounds on the north of the Savannah are in the district or county of Beaufort, in South Carolina. This district is about 60 miles in length, and has an area of 1540 square miles. Scarcely any other produce is raised for export than cotton and rice. The cotton is of the long-staple variety. The tide-swamps of the Savannah, the Coosawhatchie, and the Combahee, afford a large area fitted for the culture of rice. As already stated, the nature of the works required for the culture of this crop tend to render the average size of the plantations large, and the disproportion of the numbers of the free and slave population very considerable. From there being no large towns in this district, the disproportion is greater than in any other on the Atlantic sea-board. According to the census of 1850, the population was 38,805, of whom 6526 were free, and 32,279 slaves.

The agricultural statistics collected by the census commissioners enable us to obtain an approximate estimate of the produce of the labour of this number of slaves. It is right to observe that a considerable number are employed in the pitch and lumber trade in those parts of the pine-forests where easy access is got to the shipping ports. At the same time, the production is 47,000,000 lb. of rice, which, at an average value of 5s. per bushel, amounts to nearly £210,000,

and 12,672 bales of cotton, at £25 per bale of 400 lb., amounts to £317,800. These two sums give a produce of £527,800, or nearly £16 a head for the slave population. Besides these staple articles of export, about half a million of bushels of Indian corn, and as many potatoes, are raised for home consumption. The sum of £16 a head appears small in comparison with what is given in some of the returns of the cotton districts in the bottom-lands of the Mississippi. But in the Beaufort district the numbers of slaves that are non-agricultural must be considerable, without reckoning those that are employed as domestic servants.

Several mills are built in the neighbourhood of Savannah and Charleston for preparing the rice for market. This process consists in drying the rough rice, then shelling it by grinding-stones, as is done with oats before manufacturing them into meal. The small portions of the husks of the rice that remain on the pickles after the grinding, are taken off by pounding in large mortars with huge pestals driven by steam. The finishing process consists in polishing the rice by brushes made of hair. The rice which grows in the tide-swamps is of much better quality than what grows on dry land. The pickles of the irrigated rice are large and equal in size, and the husk is easily separated from the kernel; whereas the upland rice, being smaller and more unequal, not only is the sample inferior, but there is a great deal more waste and labour in its preparation for market.

During the time that I remained in the neighbourhood of Savannah, the weather was delightful. The days were soft and sunny, and the nights warm and exceedingly pleasant. The temperature at ten at night was sometimes as high as 64 degrees, with the sky perfectly clear. At the hotels some of the company were usually seated in the open air till late in the evening, and the crickets were heard out of doors. The thermometer was sometimes above 70 degrees during the warmest part of the day, and the atmosphere being almost still, it felt too warm for walking. To me there appeared to be a most unnatural contrast between the heat of the weather and the general deadness of vegetation. The rough and coarse grasses, which are natives of this southern region, were

quite withered, and showed no signs of vegetation. The rice, cotton, and sugar fields were all as uninteresting as our own fields of stubble or fallow are in March. The trees in the tide-swamps being mostly deciduous, were exposed to such a heat as would have made all our deciduous trees put forth their leaves in a few days in mid January. The evergreen pine was abundant enough; but pines are green in Norway in winter. The few orange and evergreen shrubs in the gardens had rather an exotic appearance. This suspension of vegetation in the Southern States during winter, when there are often considerable periods of warm weather, arises from the frequent occurrence of frosts at night, when the north-west winds prevail, and the temperature is then often lowered to freezing along the coast of the Atlantic, as well as that of the Gulf of Mexico. Indeed, I had personal experience some weeks afterwards of the severe cold to which these low latitudes are occasionally subject; for a little to the north of Mobile the thermometer fell ten degrees below freezing at sunrise, and the mercury did not rise more than one degree in the shade above freezing at mid-day with a bright sun.

The mean temperature of winter at Savannah is about 53 degrees. This is nearly about the same as that of the month of May in London, and also of the winter at Cadiz, which is $4\frac{1}{2}$ degrees of latitude further north than Savannah. But in consequence of the great extremes which make up the mean temperature of the American winter climate, a very different class of plants forms the predominant vegetation from what prevails in the south of Spain, where frosts are comparatively rare. Vegetation is a much better guide to a knowledge of the peculiarities of climate than *mean* temperatures. The orange trees are liable to be killed down by frosts over the whole territory of the United States, with the exception of the southern parts of the peninsula of Florida. But they are altogether exempt from such casualties in the south of Spain. The cotton plant furnishes a still more delicate test of the extreme climate of the low latitudes of the north-eastern American continent. In the south of Spain it is a perennial shrub; but throughout the southern

parts of the cotton zone of the United States its stem and branches are killed down every year by frosts, so that the fields require to be planted every spring.

The markets of Charleston and Savannah are pretty well supplied with vegetables in winter; but the variety was smaller than I expected. The vegetables are raised on poor sandy soils, which require to be highly manured; and during the winter and early spring a considerable trade is carried on in sending such as do grow to Baltimore, New York, and other northern cities. I saw only turnips, cabbages, celery, and radishes, in the markets. I was told that no green pease are got until the beginning of March in the earliest seasons. A succession of crops is then got till June, but none in July or August, but again in September and October. Early potatoes are not ready for table before the latter part of April or beginning of May; no sooner, in fact, than they are to be had at Land's End, in the south of England. Second crops are obtained in September and October; but the northern crop then comes into competition. The climate of the Southern States does not seem particularly well adapted for the growth of market vegetables at any season; at least, I found some parties in New Orleans making complaints of this nature.

The climate of the summer months is intensely hot, and very moist in the rice-grounds. On an average, about 23 inches of rain fall, and the temperature obtains a mean of 80 degrees. Such conditions give great force to vegetation. The early autumn is also hot, though drier than summer, and this seems to promote those miasmatic emanations which are so injurious to the white population. Yellow fever often visits Charleston and Savannah during this season, and new cases generally occur until the first frosts, which seem to have the power of entirely checking its ravages.

CHAPTER XI.

TOUR IN CUBA.

January 19, 1855.—I sailed from Charleston this morning at eight o'clock, in the steam-ship Isabel, for Havannah. A slight breeze from the north-west rendered the air cool and bracing. After taking on board the mails at the mouth of the Savannah, we steered due south, and soon lost sight of land. The 20th was a most delightful day, a uniform temperature made it altogether most agreeable, for the thermometer stood at 69° at sunrise, and only one degree higher at 3 P.M. Though the sun shone in a cloudless sky, it did not seem to have much influence in raising the temperature. In the afternoon there was not a breath of wind to ruffle the surface of the water, which was smooth as a mirror. A long swell, however, rolled in from the north-east, which I was told by the captain was occasioned by the blowing of the trade winds to the eastward, which are far more irregular in the proximity of the American continent, than in the same latitudes in the mid-Atlantic. Towards sunset, a stiff breeze sprung up from the south-east, and blew all the next day; the thermometer rose to 75° , and the air became moist and oppressive. This breeze, our captain said, was the *south-east trade*; though the idea of south-east being applied to any trade wind of the northern hemisphere is against all the theories of the tropical winds that have been proposed. Before reaching Havannah, however, I was led to infer that the southerly gales of the Florida coast play an important part in the winter storms of the United States, an opinion which was fully confirmed when I returned to Washington and consulted the Smithsonian records.

The steamers going north keep in the Gulf Stream, which flows at the rate of three or four miles an hour, but, in going south, keep out of its current, by sailing in the comparatively shallow water which intervenes between it and the land. Sometimes we were near enough the coast to be able to judge of the character of the vegetation, which consists chiefly of evergreen shrubs, fringing the shores, with pines in the background. The water was so remarkably pure, that we often saw the white coral rocks and sand in the bottom down through a great depth.

There were thirty cabin passengers, chiefly Americans. Many travellers take the steamer to Key West, one of the islands of the Florida reefs, as the quickest way to the southern and middle parts of the State of Florida. According to all accounts, this is a remarkably poor State, its surface belonging to the post-pliocene formation; and being nothing else than a continuation of the same class of soils which form the pine-barrens of Georgia and the Carolinas. Indeed, wherever the land is dry, pines occupy the whole country; but as the highest parts of it are no more than 300 feet above the level of the sea, there is almost of necessity a large extent covered with swamps, which go under the name of *ever-glades*. It is, however, some compensation that the sandy soil along the Florida coast is suited to the growth of the valuable long-staple variety of cotton, of which good crops are got during the few years in which the land is fresh and unexhausted. Even along the banks of the rivers there is little fertility, for the common produce of the sugar cane, which is frequently cultivated here, is only about 400 lbs., with 12 gallons molasses per acre; whilst on the best soils within the State the produce does not exceed 800 lbs. of sugar and 20 gallons molasses. The canes are planted in rows 5 feet apart, in the end of January or beginning of February, and the crops are cut from the 1st of November to the end of December. They are frequently injured by the frost in autumn, and seldom allowed to stand a third year. On the most fertile land along the rivers, the average produce of Indian corn is seldom more than 20 bushels to the acre. My informant, an intelligent Florida planter, had 35 slaves employed in the lumber

trade and in the culture of sugar; and from his account, which appeared consistent and unvarnished, the climate of Florida is well suited to the constitution of the negroes, and the increase of their numbers is as rapid in this as in any other of the American States.

On board the steamer, I had some conversation with a builder from Augusta, Georgia, who carried on business both in that State and in Florida. He represented the coloured masons and carpenters as inferior to the white, and that the one endured the hot season quite as well as the other. An ordinary negro carpenter is worth from 1200 to 1500 dollars, and will bring in as hire from a dollar to a dollar and a quarter a-day to his master, the latter finding him food and clothing. White workmen were receiving two dollars and a half a-day.

Early on the morning of the 22d, the mails and passengers were landed at Key West, and we left immediately for the purpose of crossing to Havannah, which is within ten hours' sail; but about six miles to the south, the steamer ran aground at Sand Key Lighthouse. We were not long upon the bank before the wreckers from Key West flocked around the vessel to render assistance, and, I daresay, they were somewhat disappointed that we required so little. A number of vessels are lost every year on the Florida reefs, and these daring adventurers make a considerable income in the enterprise of saving the cargoes and lives of the crews. One of their vessels took out an anchor from our steamer, a service for which they claimed 5000 dollars. We sustained no injury by the accident, and got off at high tide, after lying about eight hours on the reef. It was fortunate that we made our escape so soon, as a "norther" set in shortly afterwards, and blew with great violence. After the detention, it was judged necessary to return to anchor off Key West, no vessels being allowed to enter the port of Havannah after sunset.

When fairly off the reef, we presented our captain with an address, in which we took occasion to compliment him on the seamanship he displayed in getting the vessel again safely afloat. We said nothing about the blunder of running

on a sandbank within a hundred yards of the lighthouse. I was amused at the manner in which one of the passengers made the best of a nickname by cordially appropriating it, and thereby adding to his dignity. He signed himself Judge. On questioning him how he came by that title, "Why," said he, "I got it at first as a sort of nickname, and I feel that I am now entitled to it, and I always sign my name so at the hotels just as I have now done."

The sea is shallow around the Florida reefs. When we lay upon the bank at Sand Key, the colour of the water varied much. When shallow, it was of a whitish green, becoming darker as it deepened, till the unfathomable water of the Gulf Stream appeared in the distance as blue as indigo.

The town of Key West has a population of 2000. Vegetation here is tropical in its character; for the cocoa nut was growing in the gardens, with its long graceful leaves waving in the breeze. The houses were well sheltered by evergreens, and, in spite of the somewhat unfavourable state of the weather, the scene was agreeable and refreshing, after having been so long accustomed to the sombre aspect of the forests of Georgia and the Carolinas. The soil at Key West is sandy, rising only a few feet above the sea.

Early this morning the wind changed to the north-west, and the sky was cloudy. At two P.M. the temperature had fallen to 63°, with loose clouds floating from the north-west; but the upper clouds were drifting from due west by the compass. An old sea captain, who had been long familiar with this part of the ocean, called this the north-west trade wind, which at last satisfied me that the term "trade wind" is applied here to every wind that blows. Setting sail again at 8 P.M., we were soon crossing the Gulf Stream. A violent "norther" blew during the night, and drove us so rapidly on our course, that we had to ride off the coast of Cuba in a heavy sea in sight of the light on Moro Castle, which guards the entrance to the harbour of Havannah. At daybreak the waves were seen dashing with tremendous force on the rocks below the fortifications, and throwing up the spray to a great height.

At length the signal for entering the harbour was hoisted,

and we passed the cream-coloured walls of the Moro just as the sun peeped over the horizon. The high grounds to the south were studded with palm trees. The storm had now abated, and the bright atmosphere was soft and balmy.

Havannah is compactly built on the sloping ground to the west, and has a curious appearance. The houses are of a castellated form, with flat roofs, and are often painted of various colours, white, yellow, green, and red. It is as Spanish in appearance as Cadiz or Seville. The almedas around the magnificent basin, ornamented with trees now bearing beautiful flowers, show that taste is not neglected. I was disappointed with all the towns I saw in the Southern States; but Havannah far exceeded my expectations in beauty and novelty.

It was nearly nine o'clock before the officials got our luggage and passports examined. On getting on shore things looked as strange as they did from the vessel in the harbour. The streets are only about twenty feet wide, and the houses are usually of one storey; but the walls are about sixteen feet high; and for the purpose of favouring a free circulation of air, the doors and windows are large. The windows being without glass, have light iron bars for protection, and a linen screen is usually drawn across them during the heat of the day. At night, however, doors and windows are strongly bolted and barred. Along the sides of the streets are narrow footpaths, only two feet broad. The calesh, or volante, the vehicle peculiar to the country, has an odd appearance, with the negro driver equipped with large boots, and mounted on small horses, which hobble quickly past at a smart amble.

There are several American hotels in Havannah, which are well frequented, and where English visitors can scarcely fail to find agreeable company. Property is of great value. The hotel at which I stayed, though a plain building of two storeys, with only fourteen apartments, rented at 3600 dollars a year. The bedrooms for gentlemen were large, but not more so than was necessary; for as many as half a dozen were crowded into one apartment. With this exception everything else was as comfortable as could be desired. Like

most of the other large houses in Havannah, our hotel formed a square, the only entrance being by a door or gate sufficiently ample to admit a volante. All the basement rooms opened into the court. The upper into the corridor or covered gallery, which extends around the whole building, and which is ascended from the court below by a broad flight of steps. Breakfast and dinner had a considerable resemblance to each other, there being at both light claret; while coffee was served as a kind of dessert. At dinner there was a great profusion of fruits, and the bananas and oranges were delicious.

In Havannah everything indicates that there is a numerous class spending large incomes. Many of the Cuban planters have houses in town, where they reside in winter, and contribute largely to its gaiety. Immense sums of money have been expended in beautifying the city. The Paseo of Isabel, beyond the walls, is lined on each side by triple rows of palms, and other tropical plants, some of which were now in full flower, affording a most delightful place for a saunter in the cool of the evening. The scene is then specially gay, as the streets and paseos are crowded with volantes, in which the ladies sit dressed in white, and without bonnets. The sunsets were frequently most gorgeous. The balmy air of the evenings, free from all chilly sensations, renders existence in this part of the world most delightful. At a later hour, the Plaza de Armas, in front of the Governor-general's beautiful house, becomes the great point of attraction, as the military band play there till nine at night. After this hour the cafés and restaurants become crowded, and, though few drink to excess, yet great quantities of ardent spirits are consumed. The liquors are generally taken in the American fashion; little at a time, but at short intervals, so that its effects are not so apparent as where more is often drunk in social meetings in a much shorter time.

After landing I passed two days in Havannah most agreeably, amid much that was new and strange. I also made several short excursions into the country, where, although this period of the year is what is called the dead season, I observed many plants in full vigour. The majestic palm,

standing erect to the height of sixty or eighty feet; the cocoa nut, the plantain, and others, seemed to indicate that here there were a perpetual summer, and a never-ceasing vegetation.

On the second morning after my arrival, I went to procure a passport for the interior. The office was besieged with a hundred applicants, and had not a little favour been shown to me, I might have, as a stranger, remained the whole day without obtaining one. I saw many who had been at the office as early as myself, who, late in the afternoon, had not got passports. The amount of time lost in this way would be intolerable in any other country, and would occasion grievous grumbling; but making complaints of any kind is here considered little short of treason. The number of soldiers that are seen at all hours of the day in every street, reminds one of the high-handed system which prevails.

January 26.—I left this morning at six o'clock by railway for Matanzas, a seaport town about fifty miles east from Havannah, but nearly double that distance by railway. At sunrise the air was cool, but soon became warm, with a refreshing breeze. I noticed many delightful villas in the suburbs. The carriages were built in the American fashion; but here they have three classes for passengers. No restraint was put upon smoking; the most of the gentlemen had cigars, and a few of the ladies also were indulging in the cigarette. The windows were all thrown open, and by ten o'clock we were fanned by a delightful breeze.

The Cubans are rather a diminutive race of men, and somewhat effeminate in appearance. They dress in white linen clothes and broad straw-hats. In manners they are polite and agreeable. The fair sex have dark eyes, olive complexion, and pleasing features. They wear no bonnets, but a veil thrown over the head.

We stopped at Guines, and had breakfast at a small inn, where a great variety of dishes was placed upon the table, most of them tasting strongly of garlic. Numbers of small farmers or yeomanry were riding into the village mounted on

ponies, conspicuous among whom was the church beggar, having a little wooden box under his elbow with a glass front, in which was an image of Christ. In order to draw attention to his demands, he had a wooden rattle, which he used very freely. He accepted alms in "kind" as well as in money: in the former he had been rather successful; for his panniers were well stocked with vegetables and poultry.

The country immediately to the south of Havannah is somewhat hilly, but none of the hills which I saw appeared to be higher than 600 feet above the level of the sea. Much of the land was shallow, with the rocks protruding, but its quality is good and exceedingly fertile where there is sufficient depth. On many of the soils that appeared too shallow for cropping, orange trees, laden with yellow fruit, were growing wild. Sometimes a close shrubby growth of low evergreen trees occupied the waste ground, with a profusion of creeping vines thrown over their tops. Among these, the morning glory, a species of convolvulus, with its beautiful bell-shaped flowers of various colours, was in great abundance. Indeed, it often covers the railway embankments to the exclusion of almost every other plant. On both sides of the line of railway the aloe, with its strong sword-shaped leaves, forms an impenetrable fence.

For some miles to the south of Havannah nothing but common crops are seen. In many places copious springs flow from the limestone rocks, which afford a valuable supply of water for irrigation. The principal irrigated crop is Indian corn, which is cut in a green state, and forms the staple feeding for horses and cattle. A stranger soon learns to recognise this crop from a distance, by its light green leaves. Before reaching Guines the country opens out into a vast plain, where the soil is exceedingly rich, and the sugar-cane stretches far and wide. Here the level cane-fields have the appearance of boundless meadows thickly studded with the noble and stately palm. A small portion of the cane was cut and carried to the sugar-house, and the old roots were already sending up fresh shoots. The fields that had been cleared were covered with the decayed leaves of the cane.

The sugar-houses, with their wide roofs covered with pantiles, and towered over by a tall chimney stalk, did not, by any means, improve the magnificent landscape. Sugar boxes and barrels of molasses were piled up at every station, around which the ground is besmeared with this staple produce.

From Union Station the railway runs in a northerly direction to Matanzas. The country again becomes more broken and hilly, but still of great fertility, excepting in the neighbourhood of the town, where the sides of the valley are almost destitute of earth, but thickly covered with low shrubs.

Matanzas lies at the head of a finely sheltered bay, which opens out towards the north-east. There are in Cuba, I believe, about 800 miles of railway, which have served greatly to develop its immense resources. The fares are about double those of the United States, and many of the roads, as well as the carriages, are in bad repair, so that travelling is both expensive and disagreeable. The engines are generally driven by Americans, while the firemen are chiefly Chinese, of whom it requires two to throw in the wood. Several of the breaksmen also are Chinese. The engine-drivers are well paid, the common wages being £26 (120 dollars) a-month. I saw many of them when on the island, and found them polite gentlemanly fellows. They were always ready to oblige, and to impart what information they had; it was also pleasant to have one person on each train who could speak the English language.

Matanzas has a population of 20,000, and a considerable business is carried on in exporting sugar and coffee. About 150 smartly-rigged vessels were riding in the bay. The scenery from the high grounds to the north of the town is highly picturesque. It is not to be expected that the signs of wealth and progress should be equal there to those which Havannah, the capital, presents. The cafés and billiard-rooms want the style and elegance. The bull-baiting circus has been allowed to go to ruins; but the less expensive, though, perhaps, not less cruel amusement of cock-fighting, is general among the lower classes. A masquerade ball, for the benefit of the church, took place on the Sunday night that I was there,

which, to a Presbyterian, appeared to be an odd enough arrangement.

I visited several sugar estates in the neighbourhood of Matanzas. The soil is so fertile that the cane was very luxuriant, some of it rising to the height of twelve feet. One estate, which was formerly in coffee, had lately been converted into sugar-cane. Within the last ten years, the substitution of sugar-cane for coffee has taken place to a considerable extent on the island. Here, for the first time, I had an opportunity of seeing the manufacture of sugar, with all the severe labour it involves, both to man and beast. This is a fine country. One estate occupied a valley about a mile in breadth, covered with sugar-cane, and almost wholly surrounded with low rocky hills, partially clothed with palm and mahogany trees. The scene was altogether beautiful, suggesting an idea of what Paradise might have been. But what a den of suffering and misery to the poor Africans,

"Whose hard task does not divide the Sunday from the week."

As I rode over one of the estates with the planter, I saw two negroes ploughing a field that had been lying waste for some years. It was full of loose stones, and thickly overgrown with low naked-looking shrubs, which bore a yellow flower. There were two oxen to each plough, and the yoke, as usual, was fastened behind the horns. The ploughs were rude, primitive-looking implements, with only one handle, and, like the old Roman ploughs, having a round piece of wood shod with iron, which turned over, or rather merely loosened the soil. After holding it for a short time, however, I ceased to despise so simple an instrument of cultivation, as neither a Scotch nor an English plough, as at present constructed, could have been used with any good effect in so stony a soil.

The soils of Cuba may be divided into four varieties, viz., the red or vermilion, the black, the mulatto, and the sandy loams.

The vermilion soils seem to result from the decomposition of the coral formations, containing a large quantity of oxide of iron, which imparts the deep red colour. On these soils coffee is generally grown, though they are also well suited for sugar-cane, especially in moist seasons.

The black soils, on the other hand, are derived from beds of limestone, called "soap-stone." This rock furnishes good building material. In the quarry it is soft, and can be readily cut with an axe into blocks of any size or shape; but as soon as it is exposed to the weather it becomes perfectly hard. The detritus of this calcareous formation makes soils of great fertility admirably adapted for the cultivation of sugar. I noticed that the railway embankments composed of it were thickly covered with shrubs and vines; and that in the cuttings of the railway tall grasses were growing out of every crevice in which their roots could obtain any hold.

The mulatto soils are an intermediate variety between the black and the vermillion.

The sandy soils are derived from the primitive formation, and are chiefly devoted to the growth of tobacco.

On one of the plantations which I visited in this neighbourhood, there were 700 acres in sugar-cane, 1000 acres in Indian corn and vegetables. There were about 3000 orange trees scattered over the grounds. As the sugar was not refined, the labour was performed by 145 negroes, who had been almost all imported from Africa. Two hundred oxen were used for draught.

On the 29th January I left Matanzas for Cardenas, which is also situated on the north side of the island. I had to take the train again to Union Station in the plains of Guines. From Union to Cardenas I found the country level and fertile, with coffee plantations here and there. The coffee trees, which were about six feet in height, were richly covered with white blossoms; but the greater extent was under cane, and the groves of palm trees were most magnificent. Indeed, we never become weary as we gaze upon these lovely trees. Cardenas has a population of 2000; and although lying low, is said to be more healthy in summer than either Matanzas or Havannah.

On the afternoon of the 30th January, I left Cardenas, and travelled by railway in a south-east direction, for the purpose of visiting some estates about thirty miles distant from the town. Beautiful flowering shrubs, with cocoa-nut trees, formed the predominant vegetation in the marshy

grounds around Cardenas. In this part of the island there are no hills visible in the interior, and the ground rising by a gradual ascent of about four feet to the mile. In the centre of the island the summit-level is not a hundred feet above that of the sea, and the ground again slopes southward with a similar declination, thus forming a finely rounded ridge from sea to sea. About two-thirds of the country seemed to be in its natural state, covered with fine timber. The soils are of the richest description, chiefly of mulatto mould, a great part of it about a yard in depth. The railway has been recently made, and now affords the means of transporting the produce of this fertile country.

When I arrived at the San Martin plantation about sunset, a violent thunder storm came on, which continued for about two hours. Numbers of the negroes, in gangs, were at work around the sugar house, apparently altogether heedless of the war of elements. The frequent flashes of lightning rendered the whole scene a most extraordinary one.

There were 1600 acres of sugar-cane on the San Martin estate out of a total extent of 7000 acres, all of the richest description. The greater part of it was still in the natural forest; and complaints were made in this neighbourhood that the want of slaves was restricting the production of sugar. Only 200 acres were devoted to Indian corn, so that large importations of provisions become indispensably necessary. The labourers on this estate were 450 negroes and 110 Chinese. A neighbouring plantation that I visited was worked by 500 Chinese. The machinery on the large Cuban estates is of the newest and most approved description.

I spent two days on the San Martin plantation, where I experienced great kindness from Mr. Duggan, the administrator. I then returned to Cardenas, and on the following morning left for the Santa Rosa estate, in the neighbourhood of Union Junction, belonging to Miguel Aldama, the largest planter on the island. He had 15,000 acres under sugar-cane on his five estates, an extent of land not far short of that under wheat crop in the county of East Lothian. Owing to the scarcity of labourers, however, this quantity is rarely all ground; for as soon as the weather becomes moist,

and the roads too soft for carting in the cane, it is cut down and left on the ground for manure. Upwards of 2000 able-bodied slaves are required for labouring this plantation, besides from 400 to 500 Chinese. About 2000 oxen are employed for draught.

The mansion on the Santa Rosa estate was a very plain one. The room below extended the whole length of the house. The floor, which was composed of red and white brick-tiles, had no carpets, and the chairs were made of split cane.

The bedrooms were in the second storey. A long narrow room, extending the whole length of the house, somewhat resembling a verandah, was appropriated for taking meals. In the country, breakfast is at 10 o'clock and dinner at 5 P.M. Men of business rise early, and the better classes indulge in a siesta during the heat of the day. Little care is bestowed on the planter's gardens, except for raising vegetables—every able-bodied man being in demand for the manufacture of sugar. On Santa Rosa the gardener, an old negro, was living in the garden in a small hut no larger than a pig-stye, formed of the leaves of the palm-tree. The vegetables consisted of beans, peas, lettuce, radish, and tomatoes, in all stages of growth. The orchard, however, having been completely neglected, was a perfect wilderness. The lemon, the orange, and the citron, were loaded with fruit, and these, together with the almond, the fig, the cocoa-nut, the cotton-plant, bearing buds, blossoms, and woolly-seeds, made up a noble group of trees, and all unknown in our northern climes.

Notwithstanding the kindness and attention which I was receiving at Santa Rosa—hospitalities of no ordinary character—I was anxious to spend the Sunday in Havannah, and resolved to leave. Taking the train from Union Junction, I again enjoyed a delightful drive in the lovely plain of Guines, and got back safely to my old quarters in Havannah, at the Hotel de Cubano.

4th February—Sunday.—Before sunrise the soldiers were marching through the town with their bands of music. The Cubans go early to their devotional exercises, and give up the

rest of the day to recreation. I looked into some half dozen churches before breakfast, and found them all plain and antiquated-looking buildings. Rude images of the Virgin and child, of Christ on the cross, and of the twelve apostles, were in more repute than pictures. The finest churches were crowded with fashionably-dressed ladies, wearing a black or white veil thrown over the head instead of a bonnet. There are no galleries, neither are there fixed benches or seats of any kind, only a few movable chairs. The floors are laid with marble, and every lady brought a fancy-wrought rug on which she knelt, or, at certain parts of the service, sat *à la Turk*. In this latter posture the Cuban ladies had their graces shown off to advantage. Few of them, however, seemed so closely absorbed in their devotions as to be heedless of the group of gentlemen occupying the aisles. The Cuban ladies are comely, and dress with great taste; whilst their dark eyes and olive complexions impart a sweet and pleasing expression. In the church where military mass was performed, a number of soldiers occupied the aisles; while the centre was set apart for the ladies. An aged priest officiated. Not a word was heard, as the band played all the time of the service. The Spanish soldiers are small, and exceedingly ugly.

At breakfast I learned that some of our company had made arrangements to go on board the Boscawen, lying in the harbour, for the purpose of hearing the English service; whilst others were bent on going to the cock-fight. I joined the former, and went down to the wharf, and was soon put alongside the noble ship of 70 guns by British tars. There was a crew of 650 men, and the greater number were assembled on the second deck, waiting for the commencement of the service. The rosy faces of the officers and men were a remarkable contrast to the Spanish soldiers whom I had seen in church in the morning. To my no small surprise, I discovered that one of the surgeons on board was an old acquaintance — a circumstance which rendered my visit a happy one.

After dinner I resolved to go to the bull-fights that take place every Sunday afternoon in the western suburb. On

getting near the place, loud shouts apprised us that the exhibition had commenced. The building which is an amphitheatre is entered by a wide door, and a flight of steps leads to the uppermost tier of covered boxes, the others being open. It is capable of containing 6000 spectators. About 4000 were present at this time; but to the credit of the sex, there were not more than fifty ladies present. The men were dressed in white linen clothes, and wore straw hats with broad brims. The arena is about forty yards in diameter, covered with sand. The scene altogether was a gay one, though the sport was disagreeable, and, I may also say, disgusting. When I had time to look about me, I saw standing in the centre of the arena a small bull, which was gradually becoming enraged by the various methods resorted to for that purpose by its tormentors, some of whom were on foot, and others on horseback. Those on foot were dressed in tight fancy clothes, of various colours, green, white, red, and black; their jackets were decorated with gold and silver lace, and their hair was all tied back, as sometimes worn by women. They had each a scarlet cloak, from time to time held out in the hand to attract the attention of the animal, which often ran towards it. There were six men dressed in this fashion leaping about him. Equally fantastic in their dress were the two horsemen, mounted on mere ponies, which were blindfolded. The heavy riders, armed with long spears, and in huge iron boots, seemed quite a burden to the small animals. As the bull approached, he was received by spears on the tips of his shoulder, which commonly caused him to retreat. This feat must have been considered creditable to the horsemen, for it was always followed by loud acclamations. After the animal was teased for some time in this manner, a trumpet was blown, the signal for the horsemen to retire from the arena. The poor animal was now subjected to a new species of cruelty. A man entered, having in each hand a barb about two feet long, decorated with variously stained paper, cut into ribbons, which he brandished for some time over his head, till watching an opportunity, ran in before the animal, and stuck them both into its shoulder. The hooked points kept their hold, and

the barbs dangled on each side of the tortured animal. Other three footmen followed in succession, each also sticking in two barbs; so that ultimately the unfortunate animal had his shoulders nearly covered with these fanciful instruments of torture. This appeared to cause most excruciating pain to the brute, and his strength soon became greatly exhausted. In one or two cases, this kind of torture was varied, and rendered still more inhuman, by the barbs containing combustible materials, which exploded on their insertion. The trumpeter now blew louder; and the chief bull-fighter, drawing his sword, and flourishing it before the captain-general, made a short speech, informing him that he was now to kill the animal in the name of the Queen of Spain; a feat speedily accomplished by thrusting a sword between the shoulder-blade and the first ribs. In some instances, when none of the veins happened to be cut, the animal ran about for a considerable time, with the sword up to the hilt in his body, and the point protruding from between his legs. After the bull was despatched, a band of music struck up, when three asses were brought in, bedecked with gaudy trappings of red cloth, and with small flags and bells fixed to the harness. These being yoked to the carcass, drew it away. Another bull was now admitted, and subjected to the same sort of savage torture. Altogether, there were nine bulls brought into the arena, six of which were killed in the manner above described. The other three would not fight, being of a "peace-at-any-price" disposition; so they were disgraced by a cow being led in to conduct them out, amid the derisive shouts of the spectators. Half-a-dozen horses, at least, were disabled, some of them being ripped up by the horns of the bull as they stood blindfolded, and actually ran round the ring with their entrails hanging out. One horseman had his leg broken. Such was the spectacle which formed the afternoon's entertainment. The most extraordinary part of the affair to a stranger was the circumstance of the Cubans enjoying the sport, and being in raptures of delight at the most unmanly and disgusting piece of brutality I ever witnessed or could have imagined. The box adjoining the one in which the governor-general was seated was occupied

by a party of British officers ; and I could not help remarking the sober cast of their countenances during a moment when the whole spectators were shouting at a consummate piece of torture. They were seated as solemnly with their eyes fixed below as if they had been at a funeral ceremony. The passion of the people for these scenes is further evidenced from there being paintings of the roughest description on all the sign-boards in the neighbourhood, exhibiting contests with bulls, and sufficiently manifest the direction of the tastes of a people where there is no education to draw them towards other objects.

As a lady and gentleman were driving from the railway station on the day following, a negro leaped into the valante, and snatching a gold chain from the gentleman's neck, made away with it. Judge — also, who was a passenger with us in the steamer from Charleston, came in from the same quarter in a state of great excitement, as a negro, to whom he had given his portmanteau to carry, had run away with it ; but our Yankee friend gave him so hot a pursuit, that the fellow threw it down, and escaped without a caning. On the same morning, an infuriated negro, armed with a razor, killed two people in the vegetable market-place, and wounded severely a dozen others. These incidents show that, notwithstanding the large military force, there is little security for property or person in Havannah.

I visited the theatre, and was surprised as well as delighted with the magnificence of the scene, which seemed equal to Her Majesty's Theatre in London. The large pit was filled by well-dressed gentlemen ; the seats were numbered and divided. The boxes contained an array of beauty and fashion exceedingly creditable to Havannah. The acting, however, was poor, but the singing and dancing excellent. I sought the way to my hotel about midnight. At that time I scarcely met a person in the streets. It was a lovely night, the moon shining in a calm, serene sky, while the air was soft and balmy.

The number of people selling lottery tickets in Havannah attracts the notice of a stranger. Lottery drawings take place every month, and keep up the gambling excitement,

inducing even the poorer classes to squander in this manner large sums. A rather curious instance of luck happened to one of the engine-drivers, whom I met the first day I was in Matanzas. He had taken out his engine, and ran down accidentally a negro, near Union Station, for which he was imprisoned. Some of his lottery tickets a younger brother, who had recently come from New York, got hold of, one of which turned out to be a prize of 40,000 dollars. Such instances occurring now and then among the poorer classes, give a great stimulus to lotteries.

The great number of Americans who reside on the island must exercise a considerable influence in diffusing free opinions among the Creoles or Cubans. They are, however, closely watched by the Spanish officials, and by spies, who go about at all hours. Although the spies are well known in the cafés by those who reside in the island, it is rather amusing to see how they follow strangers, and get within hearing distance. There was a vast deal of excitement during the last days I was in Havannah, for the governor-general had discovered, or pretended to have discovered, a conspiracy in the city, on account of which about eighty persons were arrested. They belonged to the first families in town; and the governor-general's own secretary was among the number, and was afterwards garotted. To my great surprise and sorrow, Mr. Esheverria, the manager of the Havannah railway, was also arrested, a gentleman to whom I was indebted for great kindness and attention. My limited circle of acquaintances being thus very unexpectedly broken in upon, I was very glad when the "Empire City," in which I was to sail to New Orleans, made her appearance off Moro Castle.

CHAPTER XII.

CLIMATE AND AGRICULTURE OF CUBA.

Temperature of Winter.

THE climate of Cuba is exceedingly fine in winter, and is becoming a favourite resort for people from the United States who are threatened with pulmonary diseases. During my short stay on the island the temperature varied at sunrise from 52° to 72° , and at 2 p.m. from $66\frac{1}{2}^{\circ}$ to 82° . The inhabitants, or those who have resided for some time in the country, are remarkably sensitive of the change of temperature, and complain of cold when the thermometer sinks to 60° in the mornings. At this temperature, the engine-drivers on the railways put on as thick overcoats as one does in Scotland in the coldest days of winter. It was affirmed that this was the coldest winter that had been experienced in the island for many years. In Cuba, during the winter, the fluctuations of temperature are occasioned by changes in the direction of the wind, which is more inconstant in this low latitude than I had formerly been led to believe. As in other parts of the northern hemisphere, the southerly winds usually bring heat, and the northerly cold. The influence of the wind on the temperature is most strikingly exhibited at sunrise. Thus on 3d February the temperature at sunrise was as low as 52° with a north wind, and at sunrise on the 9th as high as 72° with a south wind. The cause of this is, that the south winds, in their passage over the Carribean Sea, become impregnated with moisture, which is the chief agent that maintains the high temperature at night. The north winds, on the other hand, being dry, permit the air to cool more rapidly after the sun has sunk below the horizon. I found that the dew point of the vapour, during the day, cor-

responded closely with the temperature of the air at sunrise. As bearing on this subject, it is worthy of remark, that while the difference between the warmest and the coldest morning is as much as 20 degrees, the difference between the warmest and coldest day is only $15\frac{1}{2}$ degrees. It is of much importance, as will be afterwards shown, to attend to the composition of what is called the mean temperature of places, for the range of the thermometer has a most material influence on vegetation. The north winds that prevail from November to March, usually at intervals of about a week, are termed "northers." These winds are well known to navigators, as occurring in the Gulf of Mexico, and as being particularly violent on the Mexican coast, from the Rio Grande to Vera Cruz. They even cross the isthmus of Central America at Tehuantepec and Nicaragua, and blow with great violence into the Pacific Ocean. The "northers" being the land winds from the territories of the United States, lower the temperature as they rush south over the warm waters of the Gulf of Mexico. Though they have a tendency to cool the air considerably in Cuba, yet they are greatly tempered by the large surface of warm water over which they blow before reaching its shores. I found the temperature of the sea from 77° to 80° at Havannah and Matanzas. On the other hand, the "northers" are felt in all their rigour along the States bordering on the Gulf of Mexico, because these land winds sweep across them without meeting with any influence in their course to mitigate their coldness and severity. In Southern Texas, especially, which is alternately subjected to the warm south winds from the gulf, and to the cold "northers," the fluctuations of temperature are of the most extraordinary character. Than Texas, there is, perhaps, no country on the globe where the inhabitants are exposed to such sudden changes from heat to cold, and to whom the lines of Milton are more applicable. They

"Feel by turns the bitter change
Of fierce extremes, extremes by change more fierce,
From beds of raging fire to starve in ice."

The temperature, along with the direction of the winds in Southern Texas, in latitude $30^{\circ} 20'$, in January 1855, while I sailed from Charleston to Havannah, will give some idea of

the nature of the climate in these regions. The observations were obtained from the Smithsonian collection at Washington.

	7 A. M.	2 P. M.	9 P. M.
19th January	52° S. E.	72° S. E.	58° S. E.
20th „	44° Calm.	81° S. W.	60° S. W.
21st „	32° N.	44° N. W.	32° N. W.
22d „	18° N. W.	56° S.	38° S.

From these figures we perceive that the temperature fell from 81° at 2 p.m. of the 20th with the south wind, to 18° on the morning of the 22d with the “norther,” making a difference of 61 degrees in the course of 41 hours. And such great and sudden changes are rendered still more disagreeable by the “northers” frequently blowing with extreme violence.

At Fort Brown, in latitude 25° 57', on the Rio Grande, which forms the southern boundary of Texas, the thermometer falls to 22° in the months of December and January, yet there the mean temperature of these months is 60° 9 and 59° 5 respectively, while that of Lisbon is only 52° 5 in January. Vegetation, however, is more vigorous at Lisbon than at Fort Brown in Texas, because its mean temperature is composed of more moderate extremes. These facts clearly indicate that mere mean temperature cannot be relied on as data upon which a correct climatology can be founded. But if we consider the great fluctuations of temperature during winter in the Southern States, bordering on the Gulf of Mexico, the causes by which vegetation is kept in check, notwithstanding their high mean temperature, are at once obvious.

It may be interesting here to give an illustration of the changes that occurred at Sparta in Georgia, latitude 33° 17', from the 19th to the 22d January 1855, on the northerly winds displacing the southerly:—

	7 A.M.	2 P.M.	9 P.M.
19th January	30° S.E.	61° S.W.	47° N.E.
20th „	48° S.E.	64° S.W.	55° S.
21st „	57° S.W.	65° S.W.	51° W.
22d „	26° N.W.	37° N.W.	30° N.W.

One fact is particularly worthy of observation, and I shall merely allude to it here as it bears upon the theory of the action of the "northers" of the Gulf of Mexico—a subject upon which there has been much discussion among meteorologists. At Texas the wind was blowing from the south at 9 P.M. of the 20th, with the temperature at 60° , but at 7 A.M. of the 21st, the north wind was blowing, and had evidently been so for some time, for the temperature had fallen to 32° . But at Sparta in Georgia, it will be observed that the great fall of temperature, on the change of the wind to a northerly direction, did not take place till the morning of the 22d—a day later than it did in Texas. The changes in the State of Mississippi were intermediate, as to time, to those in Texas and Georgia. The "norther" began in Texas, and was propagated over the Gulf of Mexico *from west to east*. As described in a former chapter, I experienced the warm wind in the steamer, along the Florida coast on the 21st January, and the "norther" struck us at Key West early on the morning of the 22d, about the same time that it began to blow in Georgia, nine degrees of latitude farther north. The temperature, however, only sunk to 63° at Key West, as the north-west winds were warmed and moistened in crossing the large surface of water in the north-east part of the Gulf of Mexico. And as I sailed into the harbour of Havannah, on the morning of the 23d January, a morning lovely and balmy as any I ever beheld in Scotland in the month of June, the thermometer, with the "norther" blowing in a clear sky, stood at sixty-two degrees.

Before leaving the island of Cuba, accounts reached me of a severe storm having occurred at Philadelphia on the 21st and 22d January 1855, a fact that drew my attention to the connection between the "northers" of the Gulf of Mexico and the winter storms of Canada and the United States. The "northers" of the Gulf of Mexico I now find *correspond to the cold westerly winds of the United States, and the two are propagated simultaneously from west to east over the gulf, and the whole territories of the United States and Canada*.

As has been already shown, the northerly winds cause a great depression of temperature in all the Southern States in

winter. The frosts by which they are accompanied kill down the stalks of the sugar-cane and the cotton plant, rendering the fields as wintry in their aspect as those of Britain during the cold season. But before the cold north winds from the vast continent of America reach the island of Cuba, they are, as already stated, so greatly tempered by the large surface of warm sea which they cross, that the thermometer rarely sinks to the freezing point, even at considerable elevations in the interior. Very few of the trees in Cuba are deciduous, and where there is a sufficiency of moisture, this high temperature maintains a perpetually verdant vegetation.

Winter, in the English sense of the term, cannot be said to exist in Cuba, for the temperature then is higher than even that of the summers of the north of France. The graceful forms of the cocoa-nut and the palm are predominating objects in the landscape; and I can never forget the pleasant emotions I felt when first I sat under their shadow. Their broad majestic leaves waving in the soft breath of the trade-winds—the deep blue azure of the expansive sky overhead—the entire absence of cold or disagreeable winds—rendered a few weeks' residence in the Queen of the Antilles of the most charming character.

Vegetables.

The winter climate is well adapted for all kinds of vegetables. I found the common potato growing most luxuriantly in the vicinity of Havannah. The sweet potato is also extensively cultivated as a winter crop, and its vines, bearing pretty blue flowers, were matted over the ground. Vegetation in the island is very rapid. Beans are ready for use in about six weeks after being sown. Radishes are fit for the table in the course of three weeks. Lettuce, a plant naturally of rapid growth, attains a great size in an amazingly short period; but owing, doubtless, to this cause, I found it wanting in flavour. Tomatoes are also raised during winter.

In summer, rain frequently falls about noon; and under a tropical sun vegetation in consequence becomes very active

Neither tomatoes nor sweet or common potatoes are raised during this season, owing to the great heat and moisture. They are grown only in the dry or winter season, when rain does not fall for several weeks successively. I was surprised to see how luxuriant many of the succulent vegetables were in the gardens, though no rain had fallen for some time, and the sun generally shone in an unclouded sky. On the San Martin sugar estate, I saw Indian corn growing from six to seven feet in height that had not got more than one-sixth of an inch of rain since it was planted, and yet the crop did not appear to be suffering from want of moisture. The beans and peas growing in the adjacent fields were also vigorous. Showers are more frequent in winter on the coast; but vegetation in the interior is chiefly sustained by the copious dews.

The large amount of moisture in the atmosphere, even during winter, in Cuba, as indicated by the high temperature at sunrise, prevents all kinds of plants from becoming exhausted of their sap as they are in higher latitudes with the same dry temperature. Indeed, I am quite satisfied that the peas, potatoes, and turnips which I saw growing so fresh and healthy in Cuba, with the sun shining in an azure sky, would have become withered in a day or two in Scotland with a sky less bright, but with as high a temperature. This is a most interesting subject to discuss in detail, but I shall merely remark in passing, that the winter climate of Cuba furnishes a good illustration of the caution required in applying the indications of the thermometer and the rain-gauge in agricultural meteorology.

Sugar-Cane.

Frosts, however, have sometimes occurred on the plantations in the interior of Cuba, and destroyed quantities of sugar-cane, which is very susceptible of frost; it kills the leaves, and forms acetous compounds in the juice of the cane that prevent the syrup from crystallizing. But it is rare that cane suffers by frosts, even on the more elevated of the sugar estates in Cuba. The cane is a tropical plant, and although it is

cultivated in the Southern States of America, it does not flower in that climate, and it is also cultivated under other disadvantages.

There are two powerful influences under which the life of the sugar-cane appears to be shortened, viz., a low temperature in winter and poverty of soil. The cane, as is well known, is a perennial plant, and when its stalks are cut close to the ground every year, the roots, like those of the willow, retain their vitality, and send up fresh shoots for another season. On some of the richest soils in Cuba, it has frequently been known to last for twenty-five years; and it is said that there are instances on record of its lasting forty years without being renewed. But after the soil becomes somewhat exhausted, it is planted every five or eight years, according to the fertility of the land. On the other hand, the influence the cold winters exercise on the longevity of the cane is rather curious. The soil in the lower Delta of the Mississippi is perhaps as fertile as any of the soils in Cuba; yet there the canes are seldom got from the rattoons, or old roots, oftener than once, when the fields have again to be replanted. The life of the cane is thus evidently shortened by the cold winters. As we go farther north, such as in the central parts of Alabama, where the winters are still colder, it is found necessary to plant sugar-cane annually. The effects of a rich soil in prolonging the life and vigour of the cane are well known in Louisiana, for an additional year's growth from the rattoons is obtained from crops planted on new land. But in general, two crops only are got from one planting in the sugar lands of Louisiana. From this circumstance alone, it may readily be conceived that the cultivation of sugar-cane is much more expensive in Louisiana than in Cuba. And although the produce of sugar in the former is little more than one half of that in the latter, yet, strange to say, the sugar lands of the Mississippi are of far greater value than some of the best soils in Cuba. The reason why the value of land is higher in America, notwithstanding the disadvantages of climate, is, as I shall attempt to show, owing principally to the circumstance of more economical management.

In Cuba, the sugar-cane does not flower on soils of average fertility until it has grown for nearly two years; but as the land becomes exhausted it flowers sooner. It is not uncommon to see a good many canes flowering on the poorer and shallower parts of the fields that have been long in cultivation, while in the richer and deeper parts none are to be observed. It is a sure symptom of the land becoming exhausted when a number of the canes are seen in flower. But in the Southern States, cane does not flower, owing to the growth of the plant being so long interrupted by the frosts, which often happen in the end of November. The cane must be all cut down in Louisiana by the end of December, and if not crushed then it must be protected from the frosts; whereas the harvesting in Cuba continues from the 1st of November to the 1st of May.

The mere cultivation of the sugar-cane in the rich lands of Cuba is quite a simple matter. The trees of the forest are cut down and removed—the stumps and roots are allowed to remain undisturbed in the ground, the brushwood is burned, and the surface soil is then ready for planting the cane. This operation is thus performed:—A hole, in a slanting direction, is made in the ground with a dibble, into which a short piece of cane is deposited and the earth gently drawn over it with the foot; or a small shallow trench, not more perhaps than two or three inches deep, is made with a hoe, into which the canes are laid horizontally and then slightly covered. The canes are usually planted about three feet apart, and as this operation takes place during the hot and moist weather, shoots are soon sent out from every joint of the cane, and the growth is so rapid as to smother every weed that threatens to establish itself in the soil along with them. No plant impressed me so much with the luxuriant character of tropical vegetation as the sugar-cane. The administrator of the San Martin estate showed me a field that had been planted in July, about six months previous to my visit. In this instance the rows were seven feet apart, and three stalks of cane had been laid side by side in the bottom of the furrow. Such a host of shoots had been sent up, that the rows formed the densest growth I ever beheld. The broad grassy leaves were just

meeting over the wide intervals, and many of them were already seven feet in height, presenting the most perfect specimens of health and vigour that could be conceived. An ordinary field of sugar-cane is a complete thicket of stalks and leaves, which varies in height from six to twelve feet, according to the quality of the land. The stalks are generally as thick as a man's wrist. The lower leaves die and hang down, then wither away, while fresh ones are constantly rising from the top, so that the surface of a cane field is always green as a meadow. In riding along some of the narrow roads that intersect the fields on the large plantations, I could not see over the tops of the cane, the dense mass of vegetation rising like a wall on both sides. The level and beautiful tract of country betwixt Guines and Cardenas, a distance of nearly a hundred miles by railway, appeared to be mostly under sugar-cane, fields of which, in many parts, bounded the view in all directions.

On rich and new land very little care is bestowed on the cultivation of sugar-cane, as it occupies the ground so fully as to keep in check all noxious weeds. I have also seen it growing on the poorest sorts of soils, upon which scarcely any other cultivated crop would have grown at all. Indeed, it is well known to yield a fair produce on soils that are too poor for growing Indian corn with advantage. As the land, however, becomes impoverished, more care requires to be bestowed on its culture. But as there is a large portion of the island still in a virgin state, new lands can be so easily obtained, that the exhausted are allowed to lie waste for some years to recruit their fertility. On the San Martin estate, where 1600 acres were occupied in sugar-cane, all the labour bestowed in the culture of this extent of land was accomplished by 200 hands in the course of six weeks. In general, the cane is not cultivated by the plough at all; the earth around the roots is merely stirred by the hoe in spring. But labour is so scarce and land so abundant, that a large portion of the cane fields receive no culture at all.

But the harvesting of the cane and the manufacture of sugar, are most laborious operations. The negroes go into the fields with a large heavy knife, and after stripping off the

withered leaves, grasp the stalk in the left hand, and cut it close to the ground by one blow of the knife. A small piece is cut from off the top, in order to separate the leaves and the soft part of the stalk, which contain little saccharine matter. Bands of men and women are employed at this work. The females are lightly clothed, and the males have usually nothing on but short trousers. Neither head nor back is protected with the slightest covering, while labouring under the broiling rays of a tropical sun.

As soon as the cane is cut, it is thrown into waggons and drawn by oxen to the large sugar-house, where it is crushed. The sugar mill on the large estates is a very powerful machine, driven by steam. It consists of three iron rollers about one foot in diameter and six feet in length. The cane is delivered to these rollers by an endless web, about thirty feet long, made of wooden cross bars. The canes are thrown upon this web, and one hand levels them with a hooked pole. I have seen about thirty negroes, men, women, and boys, employed in supplying one of these crushing-mills with cane from a large heap. The juice of the canes, which contains the sugar, runs away in a stream from below the rollers, and is immediately conveyed to the evaporating pans. The crushed stalks of the cane fall from the rollers into a cart. They are then driven away to be dried in the sun, and afterwards used as fuel.

The crushed cane, called "begasse," serves for all the fuel that is required on those estates where the sugar is not refined. Were it to be applied for manuring the fields, it would be more slowly exhausted; but, in the meantime, other necessities determine the present practice. And, besides, the fertility of some of the soils is so great, that I was told there are estates on which cane has been growing for the period of one hundred and forty years.

The sugar-house, where the refining process is carried on, is a very large erection, sometimes covering an acre of ground. Under one roof are placed the mill, the evaporating pans, the purifiers, the purging vessels, and the centrifugal pans.

The juice is first boiled in open pans, with a small quantity of calcined lime to assist in coagulating the albuminous

matters, and after it has boiled down to a certain degree of concentration, it is turned out to cool and to crystallize. In this state it is called syrup, and owing to the molasses which it contains it is semi-fluid. On many estates the produce is all sold in this form; but the greater number of the planters separate the molasses from the sugar, by putting the syrup into cone-shaped funnels with a small orifice in the bottom which allows the molasses to escape, while the sugar remains behind in a hardened state. In this form it is called Muscovado sugar.

When the sugar is farther refined, the juice, after being slightly boiled with lime, is filtered through charred bones to separate impurities, and afterwards boiled to the required degree of concentration in vacuum pans. By means of these pans the juice is boiled at a much lower temperature than in those exposed to the open air. This principle was first applied to the manufacture of sugar from beetroot, but has been recently introduced into Cuba and Louisiana. It is well known to chemists that all the saccharine matter in the cane is crystallizable sugar, but in the process of manufacture a considerable portion is converted into molasses. By over-boiling the juice, or adding too much lime, the quantity of molasses is much increased. The vacuum pans produce less molasses than the open air ones, and the process is also rendered more certain, and fewer bad "strokes" are made. On those estates, too, that have been long in cultivation, the sugar becomes more difficult to crystallize, and the quantity of molasses increases. In these cases great economy has arisen from the use of the vacuum pans.

On several of the large plantations of Cuba the centrifugal pans have been introduced for the purpose of separating the molasses from the sugar. The molasses are put into a circular vessel, whose sides are made of fine wire-cloth, through it passes a verticle iron shaft, which is the means of giving it a motion of 1200 turns every minute. This speed has the effect of driving off all the liquid molasses, leaving the sugar quite dry in the pan in the course of a few minutes.

The machinery on the sugar estates is of American, French, or British manufacture. Vast sums of money have,

in many cases, been expended upon it. The new apparatus is no doubt sufficiently tested to compel us to admit its claims as an improvement on the old; yet I heard good authorities assert that those estates were generally the most profitable which sold their produce in its crudest state. This opinion I think, under present circumstances, at first view at least, is a sound one. For since all the produce, sugar and molasses, is sent to market, there can be little carriage saved by refining it. And as the interest of capital and the price of labour is much higher in Cuba than in the countries in which it is consumed, I do not very well understand how it can be profitable to carry on the refining processes so extensively as many planters are now doing.

Commercial interest at Havannah is 12 per cent, and many of the planters borrow money at rates varying from 10 to 24 per cent, which is expended in machinery and in slaves. Machinery costs about double the amount of money in Cuba that it does in Britain. When an able-bodied slave is hired out to work on the sugar plantations, the common wages are 20 dollars (£4 : 3 : 6) a month. It therefore seems to me pretty evident that capital and the labour of slaves would be more profitably employed in raising sugar and sending it to market in its crudest state.

And not only is crude labour higher in Cuba than in Europe, but skilled labour is also higher. In consequence of the want of education among the mass of Creoles or Cubans, they are virtually shut out from all occupations that require intelligence and skill. The engineers on the sugar estates, as well as on the railways, are, with few exceptions, foreigners, who are all paid higher wages than they can obtain at home, in order to induce them to reside in a more unhealthy climate. The engine-drivers on the railways receive from £300 to £400 a year. On a sugar estate that I visited, where two engines were grinding cane, the head engineer had upwards of £400, and the other £360 a-year; the assistant engineer, for six months, £130; the sugar-master, a Frenchman, had £380, and his assistant £190; the coppersmith £320, and the blacksmith £190; the overseer £150; the administrator or manager £1000; and, last of all, the

machinery, upon the most improved principle, was erected at a cost of £60,000. This is no doubt an extreme case ; but where capital and labour are so high, it is difficult to see how refining can be at all profitable.

The sugar-cane grows for nearly twelve months in Cuba ; for it is no sooner cut down than fresh sprouts are sent up from the old roots. The crop is soonest ready on those soils that are shallow and dry ; and the grinding usually begins in the middle of November, and lasts till May. A hot and moist summer produces a bulky crop ; in fact, the length of the joints of the cane is a pretty good indication of the nature of the season. A period of dry weather always causes the joints to be short, and of wet weather the opposite effect. Dry weather in autumn is desirable to ripen the crop and concentrate the juices. The richer planters, who are not in straits for money, delay the grinding season a little, as much less fuel is then needed to boil down the juice to the required degree of concentration.

An acre of average sugar-cane in Cuba will yield about 3500 pounds of syrup, that is, sugar and molasses. This is a very large quantity of saccharine matter, when it is borne in mind that it is estimated there is 25 per cent of the whole amount of sugar left in the "begasse." The total quantity of sugar in an acre of cane is thus about 4375 lbs., which is a greater weight of pure saccharine matter than the weight of the grain of two of the largest crops of Indian corn in Cuba. Indian corn requires a richer soil than sugar-cane. The planter spoke of this crop needing fresh land to raise it with advantage. Many plans have been tried to extract a larger proportion of sugar from the cane, but none have been successful. More is got by increasing the pressure, or crushing it over again ; but the quantity of gum and other vegetable principles is so much increased, that in the separation of the impurities a great deal of the sugar is converted into molasses.

Tobacco Culture.

The culture of tobacco forms the other great source of agricultural wealth to the island of Cuba. The quality of the

fine Havannah tobacco is the result of peculiarities of soil and of climate.

In regard to climate, it is worthy of observation that tobacco is only cultivated *during winter*, when there is little rain. It grows most luxuriantly in summer with the increased heat and moisture ; but the leaves grown in this season are devoid of those qualities for which the weed is esteemed. The conditions of growth are less powerful in winter, when the temperature is ten degrees lower, and the fall of rain small. At the same time, there is more sunshine to impart those aromatic qualities which are so much relished by smokers of tobacco. In Virginia, the torrid heats and thunder showers during the summer months are by no means favourable for developing the mild aroma of a good smoking leaf. Such atmospheric conditions are better suited for cotton and Indian corn than tobacco, which must have dry weather and sunshine to produce it in perfection. Tobacco cultivated in the United States can never be so good as that which is raised in Cuba, for this reason :—In no part of the States is the climate fitted for producing the finest qualities of tobacco.

But the quality of tobacco depends as much upon the nature of the soil as of the climate. That plant, as we have already said, requires peculiarities of soil to develop certain of its qualities. And these peculiarities are such that art cannot furnish the conditions to produce them where they are naturally wanting. The sugar-cane grows chiefly on soils derived from calcareous formations ; but few or none of these are fitted for tobacco, which is cultivated only on sandy loams. Both the Cuban and American planters concur in asserting, that a large quantity of siliceous matters in soils is essential for the growth of good tobacco. As already noticed, the rich clay loams on the banks of the James River, in Virginia, do not grow good tobacco ; while the less fertile siliceous soils in the county of Louisa produce it much superior in quality. Small patches of tobacco are everywhere seen growing over the sugar-producing districts of Cuba ; but I saw no tobacco plantations in the calcareous regions over which I travelled. The culture of tobacco is extensively

carried on in the western parts of the island, over a region of country along the south coast, about eighty miles in length by twenty in breadth. The soils rest upon the primary formation. Even in the tobacco district, the planters know the spots in the different fields that produce the various qualities of leaf.

The planters whom I happened to meet did not consider tobacco a particularly exhausting crop. Its culture is the same in Cuba as in the United States. It may serve to give some idea of the enormous quantity of tobacco produced, when I state that the Havannah Railway draws £60,000 sterling a-year from the transport of this article alone.

Strange to say, a considerable portion of the tobacco used by the lower classes in Havannah is imported from the United States. This seems to indicate that the extent of soil capable of raising tobacco in Cuba is comparatively limited. A portion of the tobacco imported from America is used for wrapping up the inferior quality of the home-grown leaves. The manufacture of sugar furnishes employment to the poorer class of Cubans and the freemen of colour. This indeed seems to be the chief source of industry, for in the meaner parts of Havannah and Matanzas people rolling up sugars are seen in almost every house.

Coffee.

Coffee was more extensively cultivated at one time than it is now. A number of the coffee estates have been planted with sugar-cane, which is found to be more profitable. But as prices of coffee had lately undergone a considerable rise, I found that some of those who had made the change from coffee to sugar were rather regretting that they had done so. The vermilion soils are most esteemed for the growth of the coffee plant. It rises to the height of six feet, and looks like a hardy slow-growing shrub. It is an evergreen, and is kept closely pruned. I saw it in the southern parts of the island in blossom, which at a distance made it appear quite white. The labour of the coffee estates is light compared with what it is on the sugar estates.

Wax and Honey.

Among the minor products of the island, wax and honey were at one time produced in considerable quantities for export. Throughout the entire year, the vegetative kingdom puts forth a great variety of flowers, so that there is no suspension of the labour of the bee. On one estate, I saw a great number of hives in the hollow trunks of the palm-tree, which were cut in lengths of about three feet, and laid horizontally over a few sods. It was the last day of January, and the colony were in a state of great activity, feeding upon the flowers of the orange and the banana.

Wheat.

A small quantity of wheat is raised in some parts of the island in winter ; but I saw none of it growing, and I was told that the farmers require a license from government for liberty to cultivate this crop. This restriction, it is said, is adopted by the mother country for the purpose of obtaining a revenue from provisions imported. Oats produce little else than straw, and are rarely sown except for green food.

Rice.

Considerable quantities of rice are sown in summer on the ordinary soils of the country ; and the crops receive no more moisture than what the rains afford, but they sometimes suffer greatly when the season is dry. Rice is largely imported from the United States. The Chinese labourers have an allowance of rice ; for having been accustomed to it in their native country, they still retain a preference for it over Indian corn.

Indian Corn.

Two crops of Indian corn are raised on the same land in one year. The winter or "dry crop," as it is called, is usually sown in October and reaped in February ; and as scarcely any rain falls during this season, its growth is almost entirely maintained by copious dews. The crop at this season

yields only about thirty bushels an acre on the richest land, as it requires to be planted wide in the rows ; and at the same time, the soil must be well cultivated, to promote the absorption of moisture. Yet I saw very few crops, in my journey over the island, that seemed to be suffering from the want of moisture, though there had been little rain for some weeks. The summer or "rain crop" is more abundant than the winter one ; but from all that I could gather, Indian corn is not nearly so productive in Cuba as it is in Kentucky or Ohio. On the best soils, it seldom produces more than forty bushels to the acre ; for the climate, as in the Southern States of America, has a great tendency to produce stems and leaves.

In many parts of the island, especially in the beautiful plains of Guines, I saw large irrigated fields of Indian corn, that had been sown broadcast, producing thick and luxuriant crops. The stalks and leaves of Indian corn form the chief provender for stock of all kinds.

Plantain or Banana.

The plantain is seen growing over the whole island, affording shade and shelter to every cabin, however small or mean. Though it wants the grace and beauty of the cocoanut or palm, its form is peculiarly tropical ; none more so. In good soil, it grows to the height of twenty feet. Its trunk, or rather fleshy stem, is hollow, resembling in outward appearance that of the lily of the Nile, seen in our green-houses. It is about nine inches in diameter at the base, tapering towards the top, where it sends out long broad leaves, and also a short stalk, bearing a heavy cluster of fruit. The plantain requires to be renewed on good land only once in forty years. It sends from the root a fresh shoot every nine months, and the old trunk dies as soon as the fruit becomes ripe. Little care is bestowed upon its culture, being planted in check-rows twelve feet apart. The ground usually receives only two ploughings during the season. It is not unfrequently seen, however, growing in the shallow soils of the coral formation, where there is little in which to fix its roots, except in the crevices of the rock.

With a little attention, a constant supply of plantain fruit is obtained all the year round. It is largely used by all classes, and is commonly pulled when green, and cooked with grease or oil. In this form, it is seen at breakfast and dinner on the tables of both rich and poor. The slaves also have some plantains, or other green vegetables, supplied to them once a day; but from the softening effects of these upon the system, and the laborious nature of their work, such food must be somewhat sparingly given. It is for this reason that the plantain, though easily raised, forms a much smaller part of the food of the slaves than might be supposed. Their chief food consists of Indian corn, and dried beef from America; and no more green vegetables are given than what are considered necessary to counteract the heating qualities of the more substantial articles of nourishment. The banana is merely a smaller, but less productive variety of the plantain. It is usually allowed to become ripe before it is eaten, and is then found to be a most delicious fruit.

Humboldt estimates that one thousand square feet of ground, which will only yield 38 lbs. of wheat, and 462 lbs. of potatoes, will yield 4000 lbs. of the larger bananas. The fruit of the banana and the potatoe contain about 75 per cent of water. He reckons, however, that a demi-hectane of plantains (1.23 acres) is capable of maintaining fifty individuals for a year; while the same space cultivated and sown with wheat will only maintain two. I suspect, however, that the food-producing powers of the banana are considerably overrated. Humboldt has grounded his estimates upon the supposition that a hundred square metres (1076 feet) of ground may contain at least from 30 to 40 banana plants, or only from 35 to 26 feet to each plant. But in the finest banana plantations that I saw in Cuba, there were 144 square feet allowed to each plant; and this space seemed no more than sufficient to maintain the most healthy growth. One day I rode through a field of bananas 60 acres in extent, and in which the plants were in 12 feet check-rows. Many of the large leaves were 20 feet in height, and meeting together in the rows. There were only 550 slaves and Chinese on the plantation, yet this extent of ground was too small to supply

the quantity of bananas that was needed ; and there was besides a considerable extent occupied in yams and other vegetables. I am of opinion that two acres of potatoes, of ten tons each, would yield more food than one acre of bananas. Humboldt has well observed, however, that we are struck with the small extent of land in cultivation around the dwellings of the inhabitants in the torrid zone. Small spots of land, under plantains, yams, and sweet potatoes, yield abundance of food for little labour ; and wherever the Creole or negro is squatted upon the land, there we usually find ease and idleness. For although the banana cannot support the strength of the overtasked slave, it furnishes, when the work is light, a most wholesome, and at the same time delicious food.

Cattle.

Oxen are used in Cuba for all purposes of heavy draught. The yoke is fastened close behind the horns, and the pole of the waggon or cart is simply fastened to it by means of an iron bolt. This mode of yoking cattle causes them to move with their heads close to the ground. I saw many fine oxen dragging the huge carts at Havannah ; but the most of those I saw on the sugar estates were of rather small size, and appeared to be over-worked. They are kept in the hot season on large grazing farms in the interior ; but during the crushing season, they are fed on the green tops of the sugar-cane. On the Santa Rosa estates, about 2000 oxen are employed in carting in the cane, and driving the produce to the railways. Before the introduction of steam, most of the cane was crushed by bullock-mills ; and much is so still. The price of cattle is about the same as in England.

All kinds of vegetables and provisions on the island are high-priced, which renders living expensive in the large towns. A good fowl sells at 4s., and a turkey at 12s. A great deal of time is occupied in taking the produce of the fields to market, as most of it is transported thither on the backs of small horses, in consequence of the roads being so bad in the interior. The green stalks of Indian corn, which form the principal food of cattle and horses, are conveyed to town in this

manner ; and under this burden the animal is so much covered as to render no part of it visible except the head and legs. Charcoal, fruit, market vegetables, and poultry, are packed in panniers, and carried away for sale by the same means. One man generally contrives to manage half-a-dozen of these carrying horses, which are in rather an odd way intimately interested in each other's progress. They travel in a row ; the driver sits on the first horse, to the tail of which is tied the halter of the second one, the third to the tail of the second, and so on, until all the half-dozen are thus connected. The Creoles, but especially the negroes, have a great predilection for managing horses in this manner. It is quite common at Havannah to see one man taking two dozen of horses to have them washed in the sea. He rides upon the front horse, which has the halters of other two tied to its tail ; and from these two is formed a double row. Instead of the cows being milked in the country, they are driven into the town, and milked at the doors of the purchasers, as this is the only way to secure a genuine article. The ordinary rate for keeping a horse in livery stables in Havannah is £6 : 5s. per month.

CHAPTER XIII.

THE INHABITANTS AND SOCIAL STATE OF CUBA.

Aborigines.

THE aborigines of Cuba were of a mild and inoffensive disposition, but of a melancholy temperament, and being treated as slaves by the Spaniards shortly after the discovery of the island, their numbers rapidly decreased. A state of bondage, in which they were forced to work at gold-washing and other employments, being intolerable to their natures, many committed suicide; and the introduction of European diseases made so great a havoc, that in less than a century the race became extinct. Few or none of the American Indians seem to have the dispositions fitted for enduring a condition of slavery such as exists, or has existed, in the West Indian Islands.

Negroes and Chinese.

But what a wonderful constitution, bodily and mental, has the African! Caught while roaming at large in his native country; confined in the hold of a ship until he is transported 3000 miles across the seas, and then treated in all respects as a beast of burden,—however violent has been the change from freedom to bondage, and from ease to labour, he is found bearing up under his privations most wonderfully. His frame becomes robust, and so far fitted for the task demanded of him; and so long as he is possessed of health, his merry heart does not forsake him in the depths of his degradation. I have often stood and wondered at the powerful young slave, born in Africa, applying himself so vigorously to his hard toil with apparent resignation and cheerfulness. He is capable of enduring enormous hardships,

and making great physical exertion—qualities which have proved so valuable in cultivating the fields of the torrid zone, and have been so largely drawn upon to minister to the luxuries of the nations of the temperate latitudes.

There are about 450,000 slaves in Cuba.* Their condition with respect to physical comfort varies greatly, according to the work in which they are engaged. Probably rather more than one-third of them is employed in the production of sugar; about another third in that of tobacco and coffee, and the remainder as domestic servants and labourers in the towns.

The town slaves, though, no doubt, occasionally subject to oppression, are in comfortable circumstances compared with those in the country. The scale of comfort also varies much, according to the kind of crops which they are occupied in cultivating. The labours of the coffee plantations are the lightest, and those of the sugar the most severe. Indeed, the labour of the sugar plantations is sometimes used to punish refractory slaves in the towns or on the coffee plantations, as bridewell or hard labour is used in punishing convicts in free countries. In one of the small towns at which I stopped for some time, my landlady, a Scotchwoman, had not only severely lashed her slave for absenting himself for a day or two, but had sent him to work on a sugar estate with chains on his legs.

The season for crushing sugar-cane in Cuba lasts for six months at least; and from all I heard and saw, I am fully persuaded that the negroes are much over-tasked at this time on almost all the sugar plantations. Until I visited the sugar fields and factories, I had no conception that such severe and long-continued exertion could possibly be endured by any race of men. The common practice on all the estates which I visited, was that the able-bodied negroes begin the day's work at half-past four o'clock A.M., and at ten o'clock have an hour for breakfast. Then resuming work go on till sunset, when they get dinner and another hour's rest, after which they work on in unremitting toil till midnight, thus working eighteen hours out of the twenty-four, and with only four

* Some estimates make the numbers nearly double those we have given.

hours for sleep. The system is so thoroughly organized, that no one can relax his efforts without being liable to punishment. On the majority of the estates there is one "driver," or under-overseer, for every ten able-bodied slaves. The slaves that take in the cane in waggons from the fields to the sugar-house, usually do so in companies of ten, over whom a Creole "driver" is set, mounted on horseback, with a whip in his hand and cutlass by his side. I was told by one planter, who was working his negroes on the Sunday, that a holiday was usually allowed once a week; but I found others, well acquainted with the general system, who gave me a very different account of matters. On one large estate which I visited, the practice was that, so long as the machinery held good, there was no stopping, Sunday or Saturday, during the crushing season.

I well remember seeing twenty negro men pounding sugar, with short hand mallets, in large wooden troughs, drawn out from below a shed. They had no other clothing than short trousers, and their bare heads and backs were exposed to the sun. There were two drivers set over them, the one a creole and the other a negro. Both had whips in their hands, and the creole had a cutlass by his side. The negroes were not suffered to relax their efforts for a moment, and, hard as they were working, still I pitied the negro driver almost as much. The poor wretch was constantly crying out to the others to work harder; but this was done as much apparently for the purpose of keeping up a certain amount of excitement to prevent himself from falling asleep as to keep the others at their task; for he seemed to be completely tortured with sleep, as he leaned against the trough. I found parallel scenes enacted in the sugar-houses. In one an old negro, who was attending to the boiling pans, was constantly calling out to the negro who was throwing in the refuse of the cane or begasse, "no fire," "no fire at all." This was also done in order to keep up a certain amount of excitement, and to relieve the monotony of his work. I was assured by a working engineer that fatal accidents, arising from the negroes being overcome with sleep and falling into the boiling juice, were not uncommon.

Women, girls, and boys, are all tasked beyond their strength. The gangs that are seen about the sugar-houses are most emaciated creatures. At night they are usually found chanting some song to beguile the weary hours. The children do a little here ; for all who seemed able to run were sent out under the charge of an aged matron to gather up the dried cane that had been crushed, and to put it into heaps, or some other description of light work is assigned to them.

To all appearance there will be no improvement in the physical condition of the negroes on the sugar estates of Cuba, until the African slave trade is abolished. This is what experience has taught us in our own colonies, as well as in the colonies of other European nations. According to Humboldt, from 1670 to 1825, the West India islands imported about 5,000,000 African slaves, and at the last mentioned date, the whole African population of these islands did not amount to one-half of this number. The planters seemed to have found that it was more convenient or profitable to import negroes than to rear them on their estates. The English colonies alone imported 53,000 slaves in 1806, the last year of the slave trade. But on the abolition of this horrid traffic, the colonists were forced to encourage the natural increase of the negroes ; and this necessity was the first step towards raising their condition. Knowing the evils which flow from the African slave trade, the British Government, acting in a sincere spirit of humanity, have done their best to extinguish it. Spain received the sum of £400,000 from Britain as a compensation for the commercial loss which would accrue to her by entering upon a treaty to suppress the slave trade after 1820. This obligation Spain has been unable and not quite willing, to fulfil, and the evil effects of the traffic are seen in all their horrors on the sugar estates of Cuba.

Some planters will tell you that the slave trade is now almost abolished ; but when one visits the sugar plantations, he sees that the great majority of the men have been dragged from Africa. The Bozal slaves (those born in Africa) have their faces cut and tattooed in different ways, which is done in their native country, to distinguish the nation to which they

belong. The Cuban-born, or creole slave, has no such disfiguring insignia. Indeed, large importations must be constantly going on to keep up the numbers, where the mortality is so great; and few well-informed and disinterested people doubt of the existence of the traffic. An American engineer on one of the sugar estates informed me that his master was engaged in the slave-trade, and the principal engineer on the Havannah Railway gave me a horrid account of a cargo that had been landed on the south side of the island, and that passed in his train to Havannah. It is estimated that more than half a million of slaves had been imported into Cuba since 1826.

An able-bodied slave is worth from £40 to £50 sterling more in Louisiana than Cuba, though the climate of the latter is greatly superior to that of the former for the growth of sugar-cane. This, I think, is chiefly to be ascribed to the higher rate of interest in Cuba, the more expensive management, and the greater cost of maintaining a slave. Though the climate of Cuba is exceedingly favourable to the production of yams and plantains, which are easily raised, and form excellent food to those who are not required to perform severe labour, it is inferior to that of the Northern States of America for the production of Indian corn; and this article necessarily enters largely into the food of hard-worked slaves. It is, therefore, most impolitic on the part of the Spanish Government to maintain the high tariff on provisions. A duty of ten and a half dollars is charged on a barrel of American flour, and from 50 to 200 per cent on the original cost of rice, Indian corn, and all the necessaries of life.

The hire of a slave on the sugar plantations of Cuba is higher than in any part of the United States, and a great deal more work is exacted from the slave; but this is at the expense of his longevity. The Cuban planters seem to be actuated by the notion that it is more profitable to obtain some extra hours of labour from their slaves, and, though diseases and deaths may be more prevalent, the extra work is considered as compensating for the increased mortality. At the present time, the mortality among the slaves on the sugar plantations is from 6 to 10 per cent annually, and in some

cases it is vastly greater. The climate is in every way suited to the negro constitution, and with the exception of cholera, they are subject to no diseases of an epidemic character. The great destroyer is over-work, which, I found, was crowding the hospitals on the large estates; and several planters did not scruple to confess frankly where the evil lay. In arguing, with an administrator on a large estate, the policy of a milder mode of treatment, on the ground not only of humanity but of profit, he replied—"Very probably you are right; but so many boxes of sugar are demanded from me by my employer for every negro, I have no alternative but to follow the course I do."

So long as the slave-trade exists, the numbers on the plantation can be kept up. One of the horrors connected with this traffic, is the small number of negro women on the large sugar estates. On the majority the disproportion betwixt the number of men and women is considerable; and in all such cases the number of children is small even in comparison to the number of women. Nor is this to be wondered at, when we consider the character of the barracoon in which hundreds of negroes are huddled together. This erection forms a square, somewhat resembling the buildings on many of the large farms in Berwickshire or the Lothians. The outer wall is built higher than the inner, which permits of a slanting roof all round the square, and the tenements of the negroes are made by subdividing the covered space. The entrance is by a porch at one of the sides. The outside is often kept in fine order, being whitewashed or variously coloured, like the houses in Havannah. In such dens six hundred human beings are lodged, and the softer sex are sometimes entirely excluded. What can be more miserable than the individual isolation of the slave, torn from Africa, and doomed to labour on the sugar estates until death terminates his sufferings? What felons are subjected to so cruel and grinding an oppression? The life of the convict working in the chain-gang in the streets of Havannah, smoking his cigar during the day while at work, and retiring at sundown to his prison for the night, is one of comparative ease and luxury. It is strange how all feeling of pity for the condition of the

Africans seems to be lost in the majority of those who witness it daily. The most of the engineers on the estates are either English or Americans; who appear to become as hardened to the horrors of slavery as the soldier to those of the battlefield. By good fortune I came in contact with a number of the plantation engineers, and though the revolting accounts which they gave of the treatment of the negroes were all very similar, yet few had sympathy for them. Even some who well knew the state of matters, represented slavery as getting a worse character than it deserved. But I shall never forget the horrid accounts of the system as existing in Cuba, which I got from a most intelligent Englishman, holding a high trust on a large estate, and who had been over all the West India Islands. After giving me an account of the general management of the slaves, he concluded by saying—"It is a fearful thing to be a slave on the sugar plantations of Cuba."

The abolition of the slave trade would do away with the large barracoon; for self-interest and humanity would then be less divergent than at present. The negroes would be divided into families, as in the United States, which would lead to an augmentation of their numbers, and an improvement of their condition; for unless slavery is uprooted by a rising of the slaves, such as took place in St. Domingo, or is extinguished by the parent country, the only hope, without emancipation, rests in the increase of the slaves. It must be borne in mind that, although slavery is a most degrading institution, even in its mildest forms, its victims are subjected to very different degrees of wretchedness. Of late years, the sympathies of Englishmen have been more directed towards the mental torture which slaves, who have been so far civilized and softened in their manners, must experience on the separation of families in carrying out the internal slave trade of the United States. But looking at the difficult position of the Virginian planter, and the acknowledged improvement that has taken place in the condition of his slaves, surely no one would be inclined to advocate a return to treatment so severe, which by the numbers of the slaves would be kept in check by overwork, as is the case in Cuba. Mean as is the condition of

the Virginian slave, there is still a considerable margin of comforts in his lot which might be curtailed, and far more work exacted, before he was reduced to a state of physical suffering capable of wearing out a generation of men in the course of ten years. It is, so far, a mistake to suppose that the increase of slaves on the Indian corn and wheat plantations can be a source of much profit. No doubt it acts as a premium on humane and liberal treatment. But it is surely too much to expect that a planter who has the humanity to treat his slaves well, should have also the generosity to manumit them.

Adam Smith has well remarked that the history of all ages and nations shows that the condition of the slave is better under an arbitrary than under a free government. "In every country where the unfortunate law of slavery is established, the magistrate, when he protects the slave, intermeddles in some measure in the management of the private property of the master; and in a free country, where the master is, perhaps, either a member of the Colony Assembly, or an elector of such a member, he dare not do this but with the greatest caution and circumspection. The respect which he is obliged to pay to the master renders it more difficult for him to protect the slave. But in a country where the government is in a great measure arbitrary, where it is usual for the magistrate to intermeddle even in the management of the private property of individuals, and to send them, perhaps, a *lettre de cachet* if they do not manage it according to his liking, it is much easier for him to give some protection to the slave; and common humanity naturally disposes him to do so. The protection of the magistrate renders the slave less contemptible in the eyes of his master, who is thereby induced to consider him with more regard and to treat him with more gentleness."*

This is no doubt the secret of the Spanish laws respecting the slaves being of a mild and humane character, and at the same time favourable to manumission. They form a great contrast to the laws which existed in the English colonies at the time Smith wrote. But through corruption and weakness in the Government of Cuba, the laws respecting the slaves are not put in force, and only prove a mockery.

* Wealth of Nations. Book iv. chap. 7.

It is melancholy to think how little effect the progress of refinement and civilization among the upper classes in the island has had upon the condition of the slaves, and how little prospect there is of any improvement in this respect, until it becomes matter of necessity.

But the demand for crude labour cannot be supplied by the slave trade, and the Cuban planters, imitating ours in the West Indian Islands, have imported Chinese labourers to work on the sugar estates. When I was at Havannah, proposals were made to introduce 30,000 Chinese. I found as many as 500 employed on one estate, and nearly the whole work was carried on by them. A Chinese labourer, however, is inferior to a negro for field work on the sugar estates, but he is superior at those employments in the sugar-house that require skill and attention. On all the estates on which new and expensive machinery has been put up, the Chinese are employed in purifying the juice and manufacturing it into sugar. The planters say that a negro is apt to neglect his work if he is not constantly watched; but a Chinaman pays great attention, and can be relied upon as soon as he knows how the process must be conducted. For these kinds of work the Chinese have been of much service to the planters. They are apprenticed for eight years, and receive food and about four dollars a month as wages. The importation costs the planter 170 dollars, and none but men are imported. As a slave is worth from 700 to 800 dollars in Cuba, were the labour of the Chinese to be at all as effective, this imported labour would no doubt be a great deal cheaper. But the condition of the Chinese labourer is not much better than that of the slave so long as his apprenticeship lasts, for he is coerced as unsparingly, and he is not so well fitted to endure such treatment. I was told that large numbers of the Chinese, like the aborigines, had committed suicide; and were the facts made known, it would be found that a small proportion withstand the rigours of their treatment during the long apprenticeship. This must be pretty obvious when it is borne in mind that the mortality among the negroes is from 6 to 10 per cent annually, and vastly larger in some cases. On some of the sugar estates I found as many as one-third of the

Chinese labourers in the hospitals, and one of the administrators frankly told me that this was nothing uncommon during the crushing season.

Another point connected with the apprenticeship system is worthy of a passing notice. I heard it affirmed by some that there was little chance of the Chinese being freed on the expiry of their term of service ; and certainly the probabilities are rather in favour of this view. The humane statutes regulating the hours of labour on the plantations, as well as those favouring the slave purchasing his liberty, are now totally inoperative. It is also well known that many of the negroes that were taken by our cruisers in the middle passage, were landed in Cuba, and the mixed Commission at Havannah set them free, but apprenticed them for a limited number of years to the planters, who have made the apprenticeship perpetual, and so their condition is no better than it would have been had they been landed on the island and sold at once. This disgraceful want of good faith on the part of the Spanish Government, arising either from impotence or connivance, has been the subject of interference on the part of the British Government. Thus while the demand for crude labour is such, it is scarcely to be expected that the Chinese will have justice meted out to them when the period of their service expires.

It must be confessed that Cuba would be a much poorer country were it to free its slaves, for the principal wealth of the island depends upon their labour. The enormous exports consist almost entirely of sugar, tobacco, and coffee, and were a sudden emancipation to take place, comparatively little of these products would be raised. Cuba, at the present moment, is in a much worse condition for manumitting her slaves than our West Indian Islands in 1832. Before our slaves were set free, the African slave-trade had been abolished for twenty-six years, and the numbers of male and female negroes were equalized. In some of the smaller islands, also, the negro population had become dense, and the land had risen greatly in value, so that it was all occupied by plantations. The denser the population, the less disastrous to the interests of commerce were the effects of emancipation. Where there

was no waste land to squat upon, and where a life of ease and idleness could not be led, and a subsistence obtained by cultivating plantains and yams, the emancipated negroes had no resource but to work upon the plantations. A few illustrations of the effects of freeing the slaves upon the exports of the West Indian Islands, before and since emancipation, may not be without interest.

Antigua is a small island of irregular shape, 20 miles by 18 at its greatest length and breadth. It contains a population of about 16,000. The sugars imported from it were, in

1832	.	.	.	143,336 cwts.
1853	.	.	.	202,408 „

Coffee imported from it in

1832	.	.	.	49,888 lbs.
1850	.	.	.	none.

There have been no Coolies imported into Antigua. The only labourers which Antigua has received since 1848 up to 1852, were—

From Madeira	.	.	.	403 Portuguese.
„ Sierra Leone	.	.	.	95 Africans.
„ St. Helena	.	.	.	137 „

Barbadoes is the most fertile of all the West Indian Islands. Its total area is only about 766 square miles, or 106,470 acres. Of this area no fewer than 100,000 are under cultivation, and 40,000 are under sugar-cane. The population is about 123,000, being 734 persons to the square mile. This dense and redundant population has rendered the introduction of Coolies quite unnecessary. The exports of sugar have been more than doubled since 1832. These were—

1832	.	.	.	266,464 cwts.
1853	.	.	.	580,050 „

The amount of coffee exported was—

1832	.	.	.	158,191 lbs.
1850	.	.	.	235 „

Jamaica has an area of 4256 square miles, of which about 110,000 are cultivated chiefly as sugar plantations. The population in 1848 was 377,433, yet the quantity of sugar exported in 1853 was only 441,197 cwts., being considerably

less than that of the small and densely populated Barbadoes. The sugar crops in Jamaica were, in

1832	.	.	.	98,686 hhds.
1845	.	.	.	47,926 „

The quantity of coffee imported into Britain from Jamaica, was, in

1832	.	.	.	19,405,843 lbs.
1850	.	.	.	4,156,210 „

The total number of Coolies imported from 1848 to 1852, was 2116. The period of service was five years, at the end of which the island was compelled to give a free return passage.

The thinly peopled colony of British Guiana, on the mainland of South America, shows a similar falling off. Its area is about 76,000 square miles, and in 1843 the population was 120,000. The imports of sugar, the produce of the colony, into Britain, were, in

	Sugar.	Coffee.	Cotton.
1832	870,598 cwts.	3,492,288 lbs.	1,491,736 lbs.
1853	572,693 „	8,472 „	None.

The immigrants that have arrived from 1848 to 1852 were, from—

Great Britain	.	.	.	21
Sierra Leone	.	.	.	1842
St. Helena	.	.	.	1610
Rio de Janiero	.	.	.	296
Madeira	.	.	.	3465
Azores	.	.	.	164
East Indies	.	.	.	6867
Total				14,265

Viewing the question simply as a commercial one, the effects of abolishing slavery in those islands of the Antilles which were thinly peopled has not been successful. The history of Hayti shows us the disastrous effects upon commerce of uprooting slavery by internal convulsion. The revolution occurred in that island in 1791, and was attended with fearful violence. And, as a consequence, the organization of labour required for the production of sugar seems to have been entirely broken up. The statistics given below

tell a curious tale. The exports of that island were, in the following years—

	Clayed Sugar.	Muscovado.	Coffee.	Cotton.
1789	47,516,531 lbs.	93,573,300 lbs.	76,835,219 lbs.	7,004,274 lbs.
1822	.....	200,454 "	24,235,372 "	592,368 "
1841	.....	1,363 "	34,114,717 "	1,591,454 "

It will be observed that sugar, an article requiring much hard labour to send it to market, now scarcely forms an item in the exports of Hayti. Coffee becomes the chief produce, as it is gathered from a perennial shrub, and the labours involved in its culture are comparatively light. The production of cotton is also diminished, and it would probably have been so to a greater extent if the cotton plant had not been a perennial shrub in that island.

That the physical comforts of the coloured race in Hayti are improved since 1791, there is perhaps no ground for doubt. A free man in Hayti has an infinitely happier lot than a slave in Cuba. I often heard it stated that the negroes in Hayti are relapsing into barbarism and idolatry. But our feelings are lacerated when we find, in Cuba, society principally made up of two classes—the one subjected to the greatest degradation and cruelty—the other enjoying all the luxuries of civilization, and making no attempts to raise the helpless out of their appalling condition. Society, so constituted, contains within itself explosive elements which may burst forth in a moment, when unheard of excesses may be perpetrated.

Cuba has an area of 32,000 square miles, nearly equal to that of England proper. The total population is said to be about 1,500,000, or scarcely 50 individuals to a square mile, while Barbadoes has 734 to the square mile. Cuba is no doubt inferior to that island in natural fertility, but were it to be chiefly cultivated for elementary plants it is difficult to determine the population which it would support. At the present moment, too, there is a large extent of land of the most fertile character lying in its natural state. All experience, therefore, seems to show that the abolition of slavery in Cuba would be attended with great sacrifice to the planters.

There are about 1500 sugar, 1600 coffee, and upwards of 9000 tobacco plantations. The whole amount of sugar produced on the island in 1848 was estimated at 280,000 tons, and of coffee about 8000 tons. In 1847, there were exported from Havannah 860,000 tons of leaf tobacco, the whole of which is the produce of slave labour.

At one period the Spanish laws operated more favourably for the manumission of slaves than either the English or American; and consequently there are upwards of 200,000 free people of colour in Cuba. The larger number of this class are in the towns, and live in comparatively comfortable circumstances.

Creoles.

The white population of Spanish extraction now requires more particular notice. They are commonly called Creoles, to distinguish them from the whites who have been born in Spain. Their numbers amount to about 600,000. A large portion of the poorer class of Creoles are a sort of small farmers, who cultivate Indian corn, vegetables, fruits, and rear poultry.

The Creoles who live on the land do not seem to find it advantageous to raise coffee, though it does not involve much labour, nor even tobacco, unless for their own consumption. Sugar-cane, under the present state of things, is in a great measure out of the question. Were there no slaves, perhaps these small farmers would find it to be their interest to cultivate the sugar-cane; for its mere culture is not so laborious as that of Indian corn. The manufacture of sugar can only be economically carried out by a combination of labour. The present state of society, therefore, in Cuba, is unfavourable for these small farmers improving their condition in the slightest degree. A large number of them are employed in the plantations as slave "drivers;" and their common wages are eight dollars a month, with food; whereas a good field negro is worth twenty dollars a month. This shows that the Creole has no better way in which he can employ himself than in this most degrading occupation; and while he may be far above the negro in the scale of society, his

labour is of much less value. Through ignorance, also, he is shut out from all those employments on the estates that are highly paid. A common engine-driver on the Cuban railways receives about as much for his services as fifteen Creole slave-drivers. The Creoles in the country who are not engaged on the plantations seem to lead an easy and idle life. Everybody rides in Cuba. It is not common to see a white person on foot. The horses are small but hardy animals; and all of them have the amble, which is an easy motion for the rider. Few of the horses are handsome, having a somewhat ragged appearance from their leanness. The Creole rider wears a broad straw hat, light linen clothes, and a sword by his side. His rank among his brethren is in some measure determined by the value of this warlike appendage; for though he be poorly mounted, his sword often costs him a hundred dollars or more. The Creole is of a slender make and engaging manners. In travelling over the island, it is soon seen that cock-fighting is his favourite amusement, as almost every day one meets with cock-fighting parties, having bands of music, going to spend the day in the villages.

The great majority of the Cuban planters are Creoles, who usually reside with their families in the towns in winter. The highly profitable nature of sugar culture, and the complete system of organization of labour that prevails, allow the plantations to be managed by administrators or overseers. The Creole planters are well educated, and possess an intimate knowledge of the politics of Europe. Most of them receive a part of their education in the United States, England, or France; and they usually speak the French and English languages. After having tasted liberty in other countries, they feel more bitterly the restraint under which they live at home.

The town houses of the planters are almost all built on one plan, however much they may differ in style and ornament. A short description of one which I visited in Havannah, belonging to a wealthy planter, may be taken as a sample of the better sort. The house of two storeys, with a flat roof, forms a square building by no means imposing in its style of architecture, rather looking plain and massy. The windows,

without glass, are wide and high; and those in the basement are protected by iron railings, like the other houses in town. The walls are plastered over of a light cream colour, which has a fine effect in this glorious climate. The entrance is by a porch at one of the sides, on which there is a strong door that shuts up the establishment at night as securely as a castle. The porch is wide and high enough to admit the volante to be drawn into the open court within, which is paved with marble, and a fountain rises up in the centre, around which are beautiful flowers, filling the air with their fragrance. The stable and coach-house are on one side of this square. A broad flight of stairs, of rich white marble, highly polished, conducts to a landing on the corridor, or broad gallery, overlooking the court below. The corridor is open on all sides, and protected by marble balustrades. It is paved with marble of various colours, and communicates with the suite of rooms that are all thrown open around. The rooms, to our notions, appear rather plainly furnished; but the walls and roofs are decorated in the most magnificent and princely style. The owner of this mansion had upwards of two millions sterling invested in sugar estates. I found him affable and kind, and most anxious to make my stay in Cuba interesting and agreeable. Indeed I shall not soon forget his polite attentions in town and country.

The government and the law offices are held by Spaniards, who come from the old country to reap their fortunes in the island. As is well known, there is a great deal of jealousy and bad feeling betwixt the Creoles and the Spaniards. The governor-general is entrusted with unlimited powers, the same, in fact, as if the city were besieged; and all laws are virtually superseded. It is, therefore, not difficult to understand why the educated Creoles, as a body, earnestly desire deliverance from the galling yoke of Spain, even although there were not other elements that give intensity to the hatred existing towards the mother country. I believe the lower classes have not much if any feeling in the matter. But the alarm and distrust that Spain entertains towards her own children are exhibited in an army of 23,000 Spanish soldiers constantly in readiness to quell insurrection. And really, after one has

been a short time on the island, he becomes persuaded that there are good grounds for watchfulness on the part of the mother country.

The prize, though a valuable one, consists almost entirely in the produce of the labour of the slaves. For were slavery to be suddenly abolished in Cuba, the island would not be worth much to Creole or to Spaniard. Besides the military, there are about 35,000 Spaniards in the island who fill lucrative offices connected with the government and the customs. At present, the island affords an outlet for the members of the old Spanish families. It is said that the government officials are very corrupt, and no doubt they have many opportunities for peculation.

Upwards of twenty millions of dollars are raised in taxes. Sugar pays $2\frac{1}{2}$ per cent when exported, and fruits 7. All other agricultural productions 10 per cent when gathered. Live stock, when sold, 10 per cent; and slaves, rural and town property, 6 per cent, besides the expenses connected with registration. Heavy import duties are also levied on provisions and other necessities. The governor-generals all get the credit of conniving at the slave trade, and of deriving enormous sums from the traffic. The Creole planters make these exactions their chief complaints, and are watching an opportunity to overthrow the Spanish rule; but I do believe that these exactions would be comparatively tolerable, were there not another matter, which they consider of deeper importance, that urges them on to rebellion.

The Creoles are haunted with the idea that France and England will, in no long time, compel Spain to free her slaves. This feeling, I believe, is the mainspring of the discontent which so generally prevails among them, and which keeps up the fillibustering movements in the United States. It is also this which makes the politicians of the Northern States of America so jealous of English interference in Cuban affairs, and which led to the proposal of the United States to Spain to purchase Cuba. The sugar planters of Louisiana are not favourable to the annexation of Cuba, as it would certainly be detrimental to their own interests had they to compete with Cuban sugars admitted free of duty. But not-

withstanding this drawback, the planters of the South cannot tolerate the idea of Cuba being made free; and they all declare that the United States would be quite justified in making war against Spain were she to free her slaves.

The island of Cuba cannot afford a great revenue to Spain, after deducting the expenses of maintaining so large an armed force. But it would be worth a vast sum to the United States, could it be peaceably obtained. From the want of labourers, the resources of its rich soil can only be slowly developed in the hands of the Spaniards; but they would be very rapidly developed in the hands of the Americans, who have many slaves whose labour could be profitably employed in Cuba. In the hands of the Americans, a small armed force would be sufficient to maintain order, and the large extent of rich virgin soil would find purchasers in a few years.

When Humboldt visited the island in 1804, the price of sugar estates in the plains of Guines was from 60 to 90 dollars an acre, and adult acclimated slaves from 450 to 500 dollars each; bozal slaves about 100 dollars less. The price of slaves, however, is now nearly doubled, while that of land has fallen greatly. The San Martin estate, about thirty miles from Cardenas, containing 7000 acres of land of the most fertile description, with a railway intersecting it, and a branch running into the sugar-house, was valued, shortly before my visit, at 20 dollars an acre; and the administrator, Mr. Duggan, informed me that he considered this too high; for plenty of land as good could be bought at five dollars an acre, or little more than one pound sterling. The cause of the fall in land is, no doubt, partly owing to the rise in the price of slaves; but it must be chiefly ascribed to the large area now made available for sugar planting, by the extension of railways giving facilities for transporting the produce.

The creoles would, no doubt, prefer to rule the island without the interference of any foreign power; but a successful rising of unarmed creoles is hopeless. Therefore, rather than remain in their present state, they eagerly desire annexation to the United States. The filibustering expedi-

tions were all concocted in Cuba and supported by Cuban money; and to the first expedition under Lopez about three millions of dollars were subscribed in the island. Among all the candid planters and politicians that I conversed with in the United States, I did not meet with one who sympathized with the filibustering expeditions; on the other hand, they are not without fears lest the slaves should obtain their freedom in such attempts to grasp the island from Spain. England and France, from motives of the purest philanthropy, wish Spain to hold the island rather than the great American confederacy, under the idea, as I imagine, that slavery as an institution is less firmly maintained by Spain than by the United States. This is, no doubt, true; and the number of slaves that Cuba could support, were it cultivated by American planters, is beyond calculation. It is undeniable that the emancipation in our own colonies has given a great impulse to slavery in other parts of the world. The mode of carrying out emancipation ought to have varied according as the islands were densely or thinly peopled. If it be right and proper to entail land at home, it would certainly have been right to have entailed it in Jamaica; or some other scheme should have been devised with a view to prevent squatting. It is vain for us to think that our sentiments of humanity will diffuse themselves among the planters of Cuba or America, so as to lead to any such sacrifice as that which many demand of them—total and immediate emancipation.

The Roman Catholic church has now lost all influence for good over the inhabitants of this lovely island. A great laxity of morals prevails. I never could have imagined such a total want of religious feeling and disregard for sacred things. Though slavery deadens the moral sense, and has an unfavourable influence on society, yet it is far better to have slavery with religion than without it. If the Roman Catholic church had maintained its hold on the affections of the people, it would surely have helped to soften the lot of the slave, which is now a disgrace to humanity and the age in which we live.

CHAPTER XIV.

HAVANNAH TO NATCHEZ, LOUISIANA.

February 14, 1855.—After nearly four days' sail from Havana we began to look anxiously for indications of the mouths of the Mississippi; but none were observed until we were within twenty miles of the delta. Before this, discussions had been going on among the passengers, whether the sea still retained its dark blue colour, or was becoming tinged by the muddy waters of the great river. At last, however, at a long distance a-head, the sea appeared of a light green, and as we drew near this differently coloured water, a very remarkable line of demarcation existed. On one side of the line the water, as in the middle of the Gulf of Mexico, was of a dark blue, and on the other of a light green. This line, stretching from east to west, was so distinct, that you could fancy you might step from the one kind of water to the other, and even the waves at the point of junction seemed to be composed of two kinds of water. The sea, however, was of the same purity; the strange difference in its appearance arising from the water being comparatively shallow on the one side, and very deep on the other. It would seem that the action of the currents of the gulf have the effect of rolling out the materials brought down by the river into a vast mound around the delta, while the surface-water remains quite pure.

The weather had been wet and stormy, which rendered the voyage very disagreeable, more especially as our steamer, the "Empire City," rolled so much, that it was impossible to walk on deck. The warm south wind was again displaced

by a norther, which blew with a clear sky and low temperature as we approached the Mississippi. After sailing for more than an hour after getting into this differently coloured water, the muddy floods of the Mississippi at length appeared on the horizon, and imparted a peculiar yellow tinge to the sky; and soon afterwards reeds were seen growing in the low lands of the delta. The muddy water did not extend beyond six miles from the land, for the greater part of the sediment falls down before it reaches that distance. Before entering the south-east pass, the sea, towards the east and west, was of a dirty cream-colour, apparently having as much mud suspended in it as our rivers have when in flood. On looking to the south, the crests of the green waves were just visible on the horizon.

The Mississippi, near its mouth, does not strike one with its majesty and grandeur. The channel through which we sailed did not appear to be more than 500 yards in width, and the water on the bar was not more than eighteen feet in depth. In consequence of this shallowness of the water on the bar, navigation can be carried on only by vessels drawing little water, and they frequently strand in the mud, through which they are often literally made to plough by the force of as many steam-tugs as may be required. As there are similar bars on all the channels by which it discharges itself into the gulf, no vessel of war can ascend the Mississippi.

It was about the time of high water when we entered, and no sandbanks were visible. Drift timber, however, was seen in immense quantities, lying half exposed where there was little current. Indeed, for some miles up the river, it literally lined the banks. Reeds are the pioneers of the land plants, and were growing in the water; and for several miles from the mouth nothing was seen but their withered stems. It is seldom that the tide enters the Mississippi, in consequence of the great current of fresh water, but the sea is now and then driven over the surface of the lowest part of the delta when strong winds prevail from the south. This has the effect of preventing the growth of trees, as there are no varieties in the Southern States that do not

suffer by brackish water. The first trees that appear in ascending the river are a narrow fringe of willows.

We had scarcely entered the channel and got the swamp reeds on both sides, before we passed some habitations, erected on piles of wood. The difficult character of the navigation renders the services of a large number of pilots necessary, men of great intelligence, and highly paid. The most of them reside at the western pass, or Belize, where there is a population of 500 souls. It was said that as many as twelve copies of an *American Review* were subscribed for by this small community. To form gardens in this swampy wilderness, earth has been dug from the banks and transported at great expense. Not only is the swamp inhabited by those engaged in the navigation of the river, but settlers have already taken possession of the extremity of the delta. Considerable numbers of cattle were browsing among the reeds, and at intervals the cottages of their owners formed specks in the dreary landscape.

It will greatly assist us in obtaining a clear view of the physical peculiarities of Louisiana if we attend to the manner in which the formation of the delta takes place. Before the Mississippi was settled by Europeans, it, like the Nile, overflowed its banks every year, and that, too, up to a distance of more than 1000 miles above its outlet. Its banks being covered by a dense forest and a thick undergrowth of shrubs, the muddy water was deprived of its sediment as soon as overflowed, and filtered towards the interior. By this process a layer of alluvial soil was annually added to the land near the stream, which was thus considerably raised above the general level. The clear water flowed to the interior swamps and found its way to the sea by a channel of its own. This action of the river is still seen in the lower delta where it is not protected by embankments.

By glancing at the map, it will be observed that the delta terminates in a narrow tongue of land which carries out the Mississippi far into the Gulf of Mexico. After entering one of the channels, and sailing a short way up the river, the sea is observed on both sides, and we become sensible that the river is considerably above the level of the sea. During the

time the Mississippi is in flood, the lower part of its delta, where there are no embankments, is converted into a vast mouth. A thin sheet of water finds its way to the sea through the reeds and coarse grasses, which, as already observed, arrest the earthy matter and raise the borders of the river.

Near the mouths of the different channels of the Mississippi, it is obvious that there can be little difference in the height of the river at the high and at the low season; because the proximity of the gulf prevents any accumulation of water taking place. The difference betwixt high and low water increases as we ascend the river. It was the low season when I sailed up to New Orleans, and the mud-bank at Fort-Jackson, thirty miles from the mouth, appeared to be only about two feet in height, and, of course, as soon as the water rose higher, it flowed directly towards the sea across the neck of land. At New Orleans, 110 miles from the mouth, the difference betwixt high and low water is 10 feet; at Natchez, 40 feet; and at the junction of the Ohio, 50 feet.

The delta of the Mississippi is two hundred miles in length, averaging about seventy-five in breadth. Its estimated area is fifteen thousand square miles, and it is only a very small portion of this extent that is capable of being cultivated; for the interior is a vast swamp covered with trees, whose tops only are sometimes visible during the flood season. The Mississippi sends several smaller channels, called "bayous," through its delta in more direct courses to the sea than the one pursued by the main stream. Many of these contain little water except during flood. The banks of these subsidiary channels are also higher than the interior, having been formed by the overflowing of the sedimentary waters in a similar manner to those of the main stream. The cultivated land of the delta is entirely confined to the banks of the river and those of its bayous; indeed, rarely extending beyond a mile from the channels. And these have only been reclaimed by the formation of embankments, or "levées," to prevent inundations.

The physical peculiarities of the Mississippi have formed

the subject of considerable discussion among American engineers, and some curious results have been elicited. In the first place, it is necessary to observe, that although the river is only 600 yards in breadth at New Orleans, it is considerably more than 100 feet in depth. The bed of the river at New Orleans is thus more than 100 feet below the level of the sea; and as the water on the bar is scarcely 20 feet in depth, the water in the bottom of the river apparently flows up-hill towards the sea. It is a peculiarity of most of the large rivers in the Southern States, that they scour out for themselves deep channels towards their mouths. The greater part of the river is now embanked as far up as St. Louis, a distance of 1300 miles. Before it was so, the floods converted the delta into a vast lake; but since the embankments have prevented the water from flowing into the swamp, it has been found that the river does not rise much higher in its lower course than it did before the extension of the levées. This is a result not looked for by the engineers; it was thought that the levées would require to be raised so much higher below in proportion as they were extended up the river. The greater body of the water being kept within these levées during floods has increased its motion, and given it greater power of forming for itself a deeper channel. The same height of levée has been found sufficient to prevent inundation in the lower parts, as existed before the Mississippi was kept so much within its banks above. In a similar manner the bayous have had their channel deepened by their banks being protected by levées, and they also carry an increased quantity of water to the sea during floods.

Before reaching Fort Jackson, a belt of trees, perhaps 100 yards in breadth, occupies both banks along the river. It consists of willows, elms, alders, and fan palms, which last are from six to ten feet in height. Several full-sized and beautiful orange trees, heavily laden with fruit, were growing within the ramparts of Fort Jackson. After passing the fort, the river is embanked on both sides, and the land is chiefly in the possession of small proprietors. There are many orange groves along the river. The fruit was all gathered;

but the dark-coloured evergreen leaves relieved the dreary wintry aspect of the scenery. The willow alone was putting forth its light green leaves ; for, with the exception of a few live oaks, the trees in the swamps are all deciduous.

For thirty miles above Fort Jackson, small rice-plantations are very common on both banks. It is strange, and well worthy of observation, that these settlements are comparatively healthy for white persons, who, in many cases, cultivate the crop with their own hands. Here the cultivation of the rice crop is effected by a very different process from that which is followed in the tidal swamps of Carolina.

The Mississippi usually begins to swell in the delta about the end of February, and continues to rise till the 1st of June, when it again gradually subsides. It is thus in flood during the hot season. A ditch, having a sluice at its mouth, is dug from the river towards the swamp. The land immediately behind the levée being the highest, is cropped with Indian corn and potatoes. But at a little distance from the river, where the land is lower and can be flooded, it is laid out in narrow rice-fields parallel to the river, somewhat in the manner indicated in the sketch.



These narrow strips of land are banked all round, so that they can be laid under water after the rice is sown. The land is ploughed in March, and shortly afterwards sown and harrowed. As soon as the young plants appear above ground, the water is admitted from the river, for the purpose of keeping the land-weeds in check. The crops grow rapidly, and the depth of water in the fields is gradually increased, by raising the height of the dam over which it flows towards the swamps, so as to keep the tops of the plants just above it. There being a constant current of water from the river to the fields and over the swamp, there is no stagnation, and the fields are not laid dry till the crop is ready to be cut. The only labour bestowed in the culture of the crop is to pull up by hand the weeds, which are mostly grasses ; and

this operation is effected by men going into the fields knee-deep in water. The produce varies from 30 to 60 bushels of rough or unhusked rice, which is separated from the straw by the treading of horses. The quality of the Louisiana rice grown on these small farms is inferior to the Carolina, less skilful management being bestowed upon its culture.

These small properties under rice culture may, perhaps, throw some important light on the labour question; for this cluster of white settlers on the lower delta of the Mississippi, indicates that it is not so much the mere feeling of the degradation of free labour that prevents the whites being more engaged in agricultural operations, as that the culture of sugar does not afford a proper field for them. Two causes seem to conspire in producing this result. First, the more unhealthy nature of the sugar-fields; and, second, that free labour cannot compete, in the manufacture of sugar, with the better organized slave labour. At the present time, however, there is a tendency towards these small rice-plantations being absorbed by sugar plantations, and cultivated by slave labour.

Notwithstanding the swampy nature of the country at the mouth of the Mississippi, it is, as already observed, more healthy to the white inhabitants than any other part of the delta. The small rice-plantations, even in the lower parts of the river, are more salubrious than the sugar and cotton plantations which are under dry culture. Indeed, in hot countries, it seems to be the universal experience that the clearing and cultivating of rich alluvial lands render these districts more unhealthy than they were when covered with the natural vegetation. The swamps of the Mississippi, Savannah, and all the other Southern rivers, as well as the interior swamps, such as in the Carolinas,* were not unhealthy in their natural state; they have only become so since they were brought under cultivation.

* It is to be remarked that the climate, in the interior of the swamps, is far from being unhealthy. Lumber-men, who spend great portions of the year in it, cutting shingles and staves, testify to the general salubrity of the air and water. The opinion prevails among them, that the quantity of *pine* (?) and other resinous trees that grow there, impart a balsamic property to the water, and impregnate the air with a healthy resinous fragrance, which causes it to be an exception to the usual rule of the unhealthiness of swampy land.—“*Dred*, a Tale of the Great Dismal Swamp.” By Mrs. Stowe.

The most satisfactory theory of malaria is that which has been proposed by Liebig, in his brilliant chapters on *Putrefaction*, *Fermentation*, and *Decay*. The miasmata, which cause the various endemic diseases, are ingeniously supposed to exert their virulent influence on the human body by entering the system as gases, and acting on its fluids by producing a species of fermentation. The decomposition of animal and vegetable substances assumes, under certain conditions, very different characters, and gives rise to very different products, which may or may not have a prejudicial influence on the system. It has been generally taken for granted that marshy grounds are necessarily more unhealthy than dry, but it has been forgotten that numerous exceptions to the rule are found in all countries. The exceptions, however, appear to be all connected by one principle.

Some years ago, I pointed out that it was a well-understood fact in Scotland, when some of its inhabitants were very subject to ague, that wet clay soils produced that disease, while wet peaty soils did not. The character of the decomposition of the vegetable matter taking place on clay and on peaty soils being different, the emanations arising from the former seem to have a deleterious influence on the human system, while the latter are quite innocuous. Indeed, our peat-mosses in Scotland have decided antiseptic properties, which no doubt serve to retard decomposition; and they afford peculiar products. Among these, the vegetable extract that imparts the dark-brown colour to many of our Highland rivers is well known. Now, it is curious that all the swampy districts which are healthy in the Southern States are characterized by the water being coloured by a similar vegetable extract. In the Great Dismal Swamp of Carolina, Sir Charles Lyell says, "the water is transparent, though tinged, by a pale brown colour, like that of our peat-mosses."* It appears that all the water in the swamps of the Southern States is of the same character; and it is very probable that this fact is indicative of the vegetable accumulations from which it proceeds undergoing that particular species of decay which is not unhealthy.

* Lyell's "Travels in North America," vol. i. p. 147.

Dr. Hooker, in his "Himalayan Journals," writes :—
"The climate of Chhattuc is excessively damp and hot throughout the year ; but though sunk amid interminable swamps, the place is perfectly healthy. Such, indeed, is the character of the climate throughout the Jheels, where fevers and agues are rare ; and though no situations can appear more malarious to the common observer than Silhet and Cachar, they are in fact eminently salubrious. These facts admit of no explanation in the present state of our knowledge of endemic diseases. Much may be attributed to the amount and *purity* (?) of the water, the equability of the climate, the absence of forests, and of sudden changes from wet to dry ; but such facts afford no satisfactory explanation. The *water, as I have above said, is of a rich chesnut-brown in the narrow creeks of the Jheels*, and is golden-yellow by transmitted light, owing, no doubt, as in bog-water and that of dunghills, to a vegetable extract, and probably the presence of carbonetted hydrogen."

The climate of the Southern States of America is in every way the opposite of that of the Jheels, for it is anything but equable ; forests abound, and the changes from wet to dry are great and sudden. The only conditions that seem to be common to the healthy swamps both of America and of India are large *accumulations* of vegetable matter, resembling our peat-mosses, and the presence of this brown-coloured water. Modern geologists have been too hasty in assuming, that the high temperature of the summers on the borders of the tropics is sufficient to prevent the accumulation of vegetable matter, as is the case in higher latitudes, where in moist situations the natural vegetation of one year does not rot away during the next. Sir C. Lyell supposes the shade of trees is essential to the accumulation of vegetable matter in so low a latitude as 34°, which is that of the Dismal Swamp, where there is a deposit of peat from 10 to 15 feet in thickness. But according to Dr. Hooker, accumulation takes place in the Jheels, which are on the borders of, and even within the tropics, where there are no trees. In another part of his "Journals" he writes :—"The soil, which is sandy along the Burrampooter, is more muddy and clayey in the centre of the Jheels. with

immense spongy accumulations of vegetable matter in the marshes, through which we poked the boat-staves without finding bottom ; they were for the most part formed of decomposed grass roots, with occasionally leaves, but no quantity of moss or woody plants." In fact, it appears that these accumulations of vegetable matter, imparting the peculiar tinge to the water in the Jheels, have as close a resemblance to our peat-mosses as the different climatic conditions will admit of. The decaying process is arrested in both cases, and hence it is probable that this circumstance is the cause of the Jheels, as well as of the swamps of the Southern States in their natural condition, being comparatively healthy, like the peaty districts in Scotland.

On the other hand, the cultivation of damp soil, by which it is exposed to the atmospheric influences of a hot climate, invariably gives rise to malaria. Even the first effect of draining marshy grounds is to render them less salubrious than they were in their natural state. For this reason the Campagna in Italy became more unhealthy after its drainage, as Dr. Arnold states in his Roman History. As already observed, the sugar and cotton plantations in the bottom lands of the Mississippi, are less healthy than the undrained swampy lands in the lower parts of the delta. The malaria of the rice-fields of Italy, and of the tidal swamp of Carolina, is of a very deadly character. The practice adopted in these parts of laying the fields dry at intervals during summer and autumn, and exposing them in a moist state to the sun, seems favourable to the production of deleterious exhalations. But as Captain Smith very justly contends, in his excellent work on Italian Irrigation, when referring to the experience of India, there is nothing deleterious in the mere culture of rice, except in the mode in which the irrigation is managed. Where there is no stagnation of water, the rice-fields are not unhealthy. This opinion, I may here remark, is confirmed by the fact that the rice-grounds at the mouth of the Mississippi, on which the water is not allowed to stagnate, are far more healthy to the whites than the sugar and cotton plantations on the rich alluvial lands.

As we sailed up the river, the air was cold, and at night

became frosty. Next morning, when we landed at New Orleans, the hoar-frost was lying white on the wharves. During the day, however, the sun shone out with great brilliancy, and the temperature was pleasant and bracing. The wintry aspect of vegetation in the swamps of the Mississippi, and the dingy houses of the Crescent City, appear uninteresting, nay, almost depressing, compared and contrasted as they were in memory with the scenery of gay Havannah and its lovely neighbourhood. The wharf extends for two miles along the eastern bank; and the immense area covered with cotton bales indicates the enormous interests connected with the staple produce of the South. A fleet of steamers painted white, and having double funnels, line the landing. It is estimated that there are now 1500 steamers on the Mississippi and its tributaries.

In the early part of August, the cotton crop begins to arrive at New Orleans. The business season then commences, and from 20,000 to 30,000 white labourers are attracted from the Northern States by high rates of wages. The cotton continues to arrive at the city till the beginning of summer, when the fluctuating population again returns to the North, where the climate is more salubrious. Yellow fever makes its appearance nearly every summer at New Orleans, and commits great ravages among those who are not natives of Louisiana. The last severe visitation of this pestilence occurred in 1853. According to Dr. Bennet Dowler, the population of the city was 150,000 when the epidemic broke out in June, but 30,000 fled to the country; and up to the 1st of November, the aggregate mortality from yellow fever was 8451. At no former period did the malady spread so far into the country as in that year; for all the small towns in Louisiana and Mississippi suffered. If, as is generally believed, cleanliness mitigates the ravages of this fearful pestilence, as it certainly does in other epidemics, the city authorities are blameable for the filthy state of the streets. The sewers are open, and the putrid exhalations offensive even at this cold season: a state of things which is the more inexcusable, as even when the river is low, an abundant supply of pure water might be easily raised from the Mississippi to sweep the filth of the streets towards the swamp.

I went to the St. Charles Hotel, one of the finest establishments in the United States, so large that one thousand visitors can be accommodated. Notwithstanding this, I found all the rooms engaged when I arrived in the morning; but a large number of departures soon put me in possession of a good bed-room. The bells are all rung by electricity; by slightly pressing a small knob with the thumb, the number of the bed-room is made known in the office below. The most of the waiters are Irish, and no coloured servants are employed. Considerable difficulties are found to arise in hiring in so many slaves, and it would require too large a capital for the hotel proprietors to own them. White servants are therefore employed in the large establishments in the South. The chamber-maids are also nearly all Irish; and I was assured that they are singularly trustworthy and virtuous in the midst of the many temptations to which they are exposed.

By a rather curious coincidence, I here met a gentleman very unexpectedly about whom I had formerly made inquiries. When at Charleston, I was interested with some essays on Southern agriculture that appeared in the newspapers, but could not then learn anything of their author. I had taken down his name in my note-book, with the intention of enquiring after him when I got to the South-western States, for his writings reminded me more of those of Cato than any that I had ever read. One can therefore imagine my surprise the first morning that I landed from Havannah, when a few minutes' conversation with the stranger on my right hand at the breakfast-table, where about 200 gentlemen were seated, made me aware he was the man I was so anxious to see. The making of his acquaintance was a decided hit; for he was a Scotchman, and had been in the country for upwards of twenty years. Of all the parties to whom I had introductions in the United States, on none, somehow or other, did I consider I had so great a claim to attention as upon the one whom I had thus so unexpectedly met. He resided in the neighbourhood of Natchez, where I had introductions to several large planters, who happened to be from home, so that I afterwards gladly availed myself of my countryman's hospitality.

The New Orleans newspapers contained advertisements almost every day of sales of slaves to take place in town or country; and wishing to see how the Southerners managed this business, I devoted a forenoon to it. No slaves were advertised to be sold in town in the morning papers of that day; but on going into the rotunda of the St. Louis Hotel, I saw a group of about twenty men, women, and children, seated on a low bench in front of the stall of an auctioneer, who was then selling some town property. While this sale was proceeding, I walked about in the elegant building, which also serves as a bar-room to the hotel. It is perfectly circular within; and its domed roof, 60 feet in height, beautifully painted, is supported by Corinthian columns round the sides, where auctioneers' stalls are raised about four feet from the ground. The bar, having a fine marble counter, occupies about one-third of the side-space. The transition from selling one kind of property to the other was sudden. The first slave to be sold was put up for sale standing on the platform beside the auctioneer, and the bidding went on very rapidly among a crowd of about a hundred persons. He was a stout young mulatto, well dressed, and with so little of the appearance of a slave about him, that I was looking for the object of this active competition among those who sat below. At length he was knocked down at 1300 dollars (£265), after which he stepped off the platform. The next was a young woman, whose qualifications were well rehearsed as being a good cook, could speak French and English: she sold for 1130 dollars. Two other household servants at 900 dollars each, one of whom could speak English, French, and German. A man and wife, who were put up as field-hands, brought 1900 dollars. An old woman sold at 340 dollars. She was the only one who appeared to be much concerned about this strange scene, for she began to weep when the bidding slackened. The rest of the slaves were not sold, as the prices were deemed too low. However, the auctioneer, a Frenchman, speaking alternately in French and English, did his part with great energy. Often would he seize "the boys" by the arm, and maintain that "such strong chunky field-hands" were going far below their value. Among the slaves for sale was

a fair mulatto boy, about seven or eight years of age, neatly dressed in green pants, brown surtout, and white hat, with a band of crape around it. Altogether he looked quite a little gentleman, and as he romped about during the sale appeared perfectly happy amid all that was going on. His mother and the other slaves who were not sold were ordered to go to the "office" of the auctioneer, and the little fellow went away dancing round her as merrily as if he had been at school.

February 17, 1855.—I left New Orleans to-night in one of the first-class steamers for Natchez. There were 120 passengers on board; but this number made no appearance of crowding in the large saloon, which extended nearly the whole length of the vessel. The berths were large and airy, affording an amount of comfort that we never look for in a steamer at home. The sumptuous and prodigal display at the different meals was astonishing. The most of the Southerners with whom I came in contact were polite and well-informed; and among this class the use either of tobacco or spirits is not nearly so prevalent as is commonly believed.

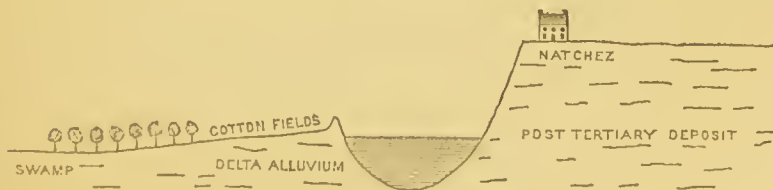
The scenery on the lower Mississippi is very poor, especially in winter, when vegetation is almost as dead as it is at the same season in our own northern climate. There is exceedingly little variety in the aspect of the country. Along the banks of the river, the forest is nearly all cut down; while tall trees, having an immense quantity of moss, of a dull-grey colour, hanging from every branch, occupy the swamps in the background. The cultivated land along the margins of the river varies from half a mile to a mile in breadth. The water being still low, the steep mud-banks gradually became higher as we ascended the stream; but I obtained almost a bird's-eye view of the country by going up into the look-out house of the steamer, which was sixty feet above the surface of the water.

The plantations are almost exclusively devoted to the culture of sugar-cane as far up as the 31st degree of latitude. After this cotton plantations begin to take the place of sugar, and in their turn occupy both sides of the river as far as the northern parts of Tennessee.

On the evening of the following day after leaving New Orleans, we reached Natchez, a distance of 284 miles by water. This was accomplished in 24 hours, though a number of stoppages were made either to take on board or to land goods and passengers. The driving-wheels were 44 feet in diameter, and propelled by two high-pressure engines, reckoned at 850 horse-power each, by which a speed of 17 miles an hour against the current was sometimes attained.

Above New Orleans I saw no wharves at any of the small towns on the river, as the soft mud-banks almost everywhere afford facilities for passengers landing. The produce of the plantations on the river is therefore shipped from the levées—a circumstance which is of great importance, as all land-carriage is saved. It was dark when we reached Natchez. A considerable quantity of rain having fallen, it rendered the mud-banks so slippery, that it was with the utmost difficulty I scrambled up to the conveyance waiting to take passengers to the hotel.

I found the features of the country much changed at Natchez. At Baton Rouge, 129 miles above New Orleans, the east or left bank of the river is about 25 feet higher than the recent alluvial deposit, and belongs to a different geological formation. This formation consists of a compact silicious clay, containing fresh-water shells of the same as the existing species. The raised land at Baton Rouge is the first appearance on the Mississippi of the vast plain or table-land that stretches towards the Lakes, with an easy ascent of less on an average than one foot to a mile. At Natchez this formation rises about 300 feet above the river, and forms, from being undermined by it, a precipitous bank of that height, whilst the west bank is so low, that the plantations



are protected by levées. The figure will show this formation more clearly.

The top of the high bluff or bank at Natchez commands a view of the windings of the Mississippi, which is soon lost amid the immense cedar swamp that stretches towards the west. Here the river was narrower than at any other place I had seen. Its breadth did not seem to be more than 500 yards, but its depth is considerably above 100 feet, and the current is rapid.

The high table-land, as in other Northern States, forming the precipitous bank at Natchez, is broken in the vicinity of the river into a series of rounded eminences, by the action of the streams from the interior of the State. The face of the country, from this cause, is somewhat irregular in the neighbourhood of Natchez, but it becomes less so a few miles inland.

Natchez is the principal town of the State of Mississippi, but it does not contain a population of more than 6000 souls. The houses are chiefly built of red brick; the streets wide, and planted with trees along the sidewalks. In the suburbs are numerous fine villas, with flower-gardens ornamented with statuary. I believe there is as refined society to be found in Natchez as in any other part of the United States. The American system of slavery, however, is by no means favourable to the growth of the inland towns. In fact, the poorer part of the white population in such towns as Natchez, and Baton Rouge in the South, are placed in anything but a favourable position. Many idlers are to be seen in all the towns, and I found the chief frequenters of the best hotel in Natchez low drunken fellows; and though the accommodation was indifferent, the charges were as high as at the St. Nicholas in New York.

The overseers of the plantations are selected from the lower grade of whites, and are naturally enough looked down upon by the best society of the South. An overseer has often a large amount of power delegated to him. I was informed that some successful planters, who hold several estates in this neighbourhood, make it a rule to change their overseers every year, on the principle that the two years' service system is sure to spoil them. This must, no doubt, aggra-

vate the condition of the slave, for it is generally allowed that the negroes are better cared for under the eye of a master than of an overseer, especially when his connection with the latter is of so temporary a character. The cultivation of cotton and its preparation for market are comparatively simple processes, and capitalists find an investment in cotton estates profitable even when they are managed by overseers. But it is more difficult to manage a sugar plantation in the Southern States, for which reason a sugar plantation can seldom be profitable unless the planter resides upon and superintends it himself.

The same formation found in the bluffs at Natchez extends for upwards of twelve miles to the east of the Mississippi, and the surface-soil over this region is one of the finest for the growth of upland cotton in the Southern States. It is upwards of 150 miles from north to south, and was originally covered by a magnificent forest of hard-wood. Naturally very fertile, it consists of a friable vegetable mould, from a foot to a foot and a half in depth. Indeed, it is one of the richest and most easily cultivated soils that I ever saw.

Rich as these uplands are when first broken up, they are subjected to certain deteriorating agencies of which we hardly know anything at home. This deterioration does not arise so much from the exhausting system of culture as from other circumstances peculiar to the soil and climate. As formerly mentioned, the subsoil is a compact sandy clay, which does not crack with drought, and is in a measure impervious to air or water, for which reason, perhaps, it is far from favourable to vegetation. It must be remembered that rain in this region generally falls in heavy thunder-showers; there being sometimes as much as from three to four inches of a fall during one prolonged thunder-storm. These deluges of rain surcharge with water the beautiful surface-soil, rendered loose and free by cultivation; and as the water cannot descend into the subsoil, it at length bursts in torrents down the slopes, and carries large quantities of the fertile mould into the streams, and thence to the Mississippi. Thus the land would suffer more waste under fallow than under crop, for vegetation assists in checking the

destruction. From Natchez to Washington, a distance of six miles due eastward, the country is irregular, and all the sloping land is ruined, for the fine soil has been as completely carried off by washing, as if it had been carted away. Little remains but the subsoil, which is nearly as unproductive as the pine barrens of Carolina.

In America the quality of the soil is generally indicated by the kinds of trees growing upon it. The first settlers found these uplands covered with a magnificent forest, consisting of liquid-amber, elm, ash, white and red oak, cherry, magnolia, mulberry, and the wild grape, with now and then a solitary pine. The greater part of this fine forest is cleared away, and the land is now under cotton cultivation, or abandoned as exhausted. Here and there, however, a patch of the original forest is to be seen to attest its former grandeur. When the land is first cleared, and the brushwood burned, the stumps are allowed to stand till they moulder by natural decay. With the slightest scratching with the plough, this virgin soil has in many instances been taxed by from fifteen to twenty crops of Indian corn or cotton in succession.

Not only is the exhaustion of these soils exhibited in the inability of the land to produce cotton or Indian corn, but the oak, the magnolia, and the other broad-leaved trees that flourish on such land in its natural state, now no longer find there the conditions which are favourable to their growth. It is a curious fact, that if the primeval forest be cut down, and the soil not wasted by washing or cropping, the same trees will again spring up and occupy the ground. But it is still more curious, that totally different trees make their appearance in all cases in which the land has been exhausted by tillage, and afterwards abandoned to nature. In the latter case the pine and dwarf-oak alone occupy the ground. These facts are directly opposed to Decandolle's theory of rotation of crops. The substitution of the pine for the oak and magnolia in the exhausted soils of the Natchez uplands is evidently owing to the altered physical condition of the soil.

Horticultural experience favours this view of the matter. Fruit trees do not grow well on those exhausted soils, and this cannot be ascribed to mere sterility, for the apple-tree

flourishes and produces abundance of fruit on the granitic gravels of New England, which would certainly be too poor for cotton, even though the climate there were as favourable as in Mississippi State. It is probable that the barren nature of the subsoil, arising from its being so compact, cannot maintain the magnolia and peach in healthy growth, both of which must have their roots where there is a sufficient supply of moisture during the torrid heat of summer. I was informed that neither the peach nor any other fruit tree would thrive on the exhausted soils, however well they were manured, unless the ground was cultivated by the plough or the spade. If the cultivation be neglected, many of the leaves drop off during dry weather; and when the rains again set in, the fruit becomes dropsical, and falls off also. The same kinds of fruit trees do well on unexhausted ground without any cultivation or manure. These facts all point to the view I have already expressed—that in these instances it is the physical condition of the soils which determines the particular kinds of trees that flourish on exhausted and unexhausted soils. The pine, it is probable, evaporates less than the broad-leaved trees, and can therefore thrive in dry sandy soils, where other trees cannot live. Sir Humphry Davy says, in some of his lectures on agricultural chemistry, that plants with glossy leaves do not evaporate so much as others. Perhaps this will explain the reason why we find the live oak, with its thick glossy leaves, the only hard-wood tree growing beside the long-leaved pine on the dry sands of the pine barrens.

CHAPTER XV.

EXCURSION ON THE MISSISSIPPI.

February 20, 1855.—This forenoon I dined at a friend's at Washington, about six miles to the eastward of Natchez. A party were dining with him; and although he had treated me to some catawba at New Orleans, there was no wine on the table. The customs are much changed within a few years with respect to the use of wine, for it is now common to dispense with it altogether. He was largely engaged in horticulture, and possessed about twenty slaves, for whose instruction he was doing a good deal. He read and explained to them a portion of Scripture twice a week. He had also worship morning and evening in his own family, and I found him a candid and earnest man. At the same time he was a most rigid disciplinarian with his slaves.

Having an introduction to a cotton-planter, whose estate lay about eight miles south of Washington, I set off early next morning in a one-horse buggy with a negro to drive and show me the way. The air at daybreak was cold, and the ground covered with hoar-frost; but it became warm and pleasant by mid-day. Little rain had fallen for some weeks, and the roads were dry and good, though their condition must be wretched during the rainy season, as no materials are used for road-making. Wherever the road was much inclined, the rains had excavated deep cuttings, which had all the appearance of having been made by pick and spade; for the sides of the deep gullies cut out of the compact subsoil were quite perpendicular. The traffic on the roads is trifling, consisting of little else than the carrying of the cotton to the

nearest spot on the banks of the Mississippi, and bringing back some provisions for the negroes.

In this region the most of the plantations are of considerable extent, as is generally the case wherever the soil is rich. The planters' houses are made of wood, with a veranda in front, and flowers and ornamental shrubs in the gardens. The country is well cleared, for there is only a small extent of the original forest to be seen. The cherokee rose forms an admirable fence, through which, when fully grown, cattle cannot pass. Its bright-green glossy leaves were refreshing amid the general deadness of the vegetable world. The stem is armed with prickles like the briar, but grows like the bramble, forming a finely rounded hedge, from eight to ten feet in breadth, and from six to seven in height.

The plantation I visited was about 3000 acres, consisting of the rich sandy loam which I have already described as prevailing in this part of the country. The surface, still undulating in long stretches, is less broken, however, than in the vicinity of the Mississippi. The fields are upwards of one hundred acres in extent, enclosed by the cherokee rose. I had a good opportunity of examining the nature of the soil in a long walk over the plantation in search of the owner. On one part of the estate the fine forest of oak and magnolia had been recently cut down, and the blackened stumps of the trees were standing; but the burning of the branches and brushwood had cleared the surface so as to allow the soil to be scarified by the shovel plough, and Indian corn or cotton to be planted. In this dry soil the roots of the hard-wood trees completely decay in the course of eight or ten years.

The negro, a fine lively fellow, who conducted me over the plantation in search of his master, was about thirty years of age. I was somewhat amused at the matrimonial arrangements to which he had been a party. He was "raised" in Missouri, and for several years was on board one of the St. Louis steamers; and, about three years ago, was sold "down south." At that time he had a free negro woman as his wife, but he had heard nothing of her since he left the North. This appeared a hard case so far as he was concerned, but he added that she had formerly been united to a free man, and had run

away from him. He confessed that he was now happy and thought nothing about her, as he had married a wife belonging to the estate, who was only sixteen years of age.

There were about 240 negroes, old and young, on this plantation, and it is customary to reckon the number of effective hands at one-half of the whole. The women, as well as the men, hold the plough, which is usually drawn by a mule, ploughing being comparatively light work on these friable soils. The negroes seemed well cared for on this estate, and to enjoy a considerable amount of physical comfort. Their cabins, made of sawn wood, were twenty feet in length by eighteen in breadth, white-washed without and within, and the floors laid with wood raised a few feet above the ground. The interior had a naked appearance, as there was no furniture except the beds and a few chairs. The bed-clothes were clean, and though the domestic comforts might not be great, their humble furnishings were not untidy. The cabins, as usual, formed a kind of street, each being built at a little distance from the other. The hospital, standing by itself, was under the charge of an old negro woman, and there was only one patient in the establishment during my visit; but the autumn is the unhealthy season.

Every arrangement is made to obtain as much labour as possible from the negroes without overtasking them. The young children are left, during the working hours, in charge of an old woman, and the mothers of those who are at the breast come from the fields three or four times a day to nurse them. The older children are also put under the charge of a woman during the day, but lodge with their parents at night. It is not usual for negro children to do any work until they are nine or ten years of age. In going over the "quarters," and other buildings, with the planter, we were surrounded by a score of negro children, apparently the happiest beings imaginable, and on very familiar terms with their master.

The weather is subject to great changes here, as in other parts of the continent, and the cold is often considerable; indeed, the thermometer was down at 25° this morning. Warm clothing, therefore, requires to be provided in winter for the negroes, as well as light clothing in summer. The

cloth used on the plantations of the South is almost all home-made; and its manufacture affords suitable employment to the infirm hands. On this estate I found two small hand-machines ginning and spinning cotton at one operation, and a web of "linsey-woolsey" was on the loom.

It is considered to be the acmé of plantation management to buy no articles which are required by the negroes or in the working of the estate. I was assured by a gentleman who has made southern agriculture the subject of much study, that if the crop of cotton formed the nett produce of a moderately fertile and well managed estate, 24 per cent might be cleared upon the capital invested.

Strange to say, it is more difficult to raise the requisite quantity of provisions for a Southern plantation, than to manufacture waggons, ploughs, harness, and articles of clothing. The bacon is almost entirely imported from the Northern States, as well as a considerable quantity of Indian corn. This is reckoned bad management by intelligent planters; and in one case I found it forming the subject of lamentation by a slave-dealer, who maintained that planters could not possibly thrive while they bought their bacon and corn at such high prices, and sold their cotton so low. When provisions are cheap, a great impulse is given to the extension of the culture of cotton, more especially on the inferior class of soils, which are not equally well adapted for Indian corn. It is said that planters who cultivate little else than cotton, which has hitherto fluctuated much in value, and who make it a practice to buy the greater part of their provisions, seldom do well.

On this plantation as much Indian corn was raised as was needed; but little bacon, which is imported from Ohio. The average sum annually expended on this article was upwards of £800. Large plantations are not suited to the rearing of hogs; for it is found to be almost impossible to prevent the negroes stealing and roasting the young pigs. This is one of the disadvantages in raising certain kinds of produce incidental to a system of slavery. The number of cattle which can be raised on the large cotton plantations, do little more than replace the draught oxen that are required.

The sheep only supply the wool needed for clothing ; and the mules used for ploughing are bred in the Northern States. The bad qualities of the soil and climate for producing the finer grasses, and the great expense of cattle food cultivated by slave labour, render the raising of stock for exportation, under present circumstances, in a great measure undesirable.

As the result of many inquiries among planters and negroes, I believe the latter are, in general, liberally fed and well clothed. It would, perhaps, not be economical to do otherwise ; but, at the same time, the treatment of the negroes with respect to food, and to many privileges which are granted, is regarded, by the better class of planters, as a matter of personal honour.

The common allowance for an able-bodied negro is half a pound of bacon a day, with Indian corn, molasses, and vegetables of different kinds in their season. Formerly the supply was dealt out to each negro once a week. This system, however, is pretty generally abandoned, because it was found that, however liberal the allowance might be, it rarely served until the day of distribution again came round. The food of the negroes is, therefore, commonly cooked in one kitchen, and divided at every meal. Less time is thus wasted in cooking, and the health of all is better maintained, than when each family had their food to cook after coming in from the fields. The hours of labour on the cotton plantations are from sunrise to sunset, and in summer an hour for breakfast, and two, and even three, are sometimes allowed for dinner.

The increase of negroes on a cotton plantation forms, under good management, not an inconsiderable item in the profits. So far as I could learn, the increase varies from two to six per cent throughout the cotton region. This holds out a premium for humane treatment, as it almost amounts to the interest of the capital invested in slaves.

The quantity of cotton which can be produced on a plantation, is limited by the number of hands that can be turned into the fields during the "picking," or harvesting of the crop. Like some other agricultural operations, this is a simple one, though it does not admit of being done by machi-

nery, as a certain amount of intelligence must direct the hand. Here, the cotton seed is put into the ground in April, and the ridges are made from three to seven feet in width, according to the poverty or richness of the land. The plants are singled out from one foot to three feet apart on the ridges; and in rich land they form strong shrubs, which sometimes rise to the height of eight feet. The stem and branches of the short staple cotton are killed every year, in the Southern States, by the frosts of winter, and the crop thus requires to be planted annually. The lower branches are the first to put forth blossoms and to bear ripe pods, containing the fibre attached to the seeds, which open out of the husks, and appear as round balls of snowy whiteness of the size of apples. While the lower branches are bearing ripe cotton, the upper are putting forth fresh buds and flowers, which ripen seeds at a later part of the season. As soon as a negro can pick from forty to fifty lbs. of cotton from the husk in a day, harvesting commences. The "picking" season usually begins about the middle of August, and often continues until the 1st of January. Frosts, however, frequently kill the plants in November, and the yield of cotton is diminished, as they would grow all winter were the temperature sufficiently high.

As soon as the cotton is picked from the plants, it is carried to the gin-house, and, if dry, ginned at once; if not, it is spread out in the sun. Whitney's saw gin is now universally used for separating the fibre from the seed of the short staple variety of cotton, and though a simple machine, its invention gave a great impetus to the culture of cotton in the United States. It is often driven by a small steam-engine, but more frequently by mules. It consists of a drum, on which a series of circular saws are fixed, and the edges of the saws enter a hopper, into which the cotton in the seed is put. The saws are tightly fitted, and the drum, which revolves rapidly among the seeds, pulls off the cotton fibre, which is swept from the teeth of the saws by a brush, revolving at a still greater speed than the saws. The cotton falls from the gin as loose and as pure as snow. It is then packed into bales, which weigh about 400 lbs. each, and in

this state it is sent down to New Orleans to the commission agents.

Some of the land on this plantation has been cultivated for forty years, and is still in good condition. A large extent, however, was temporarily abandoned to recruit itself under weeds and rough grasses. The ridges of the Indian corn and cotton are made quite horizontal, with the view of preventing the rains washing away the soil. Horizontal cultivation was introduced into this district about forty years ago by a Scotch farmer, and has now extended over the greater part of the cotton region, where the soil is liable to be washed by the rains.

Though there is no regular rotation followed on the cotton plantations, it is common to take two crops of cotton and then one of Indian corn, by which the land is kept free from weeds; and these crops are usually repeated until the produce of both is small. The land is then abandoned to nature for a series of years; and it is not easy to say how a better system could be followed, as labour is high, and the grass-growing qualities of the soil are bad. On this plantation there are usually 1200 acres in cotton, 400 acres Indian corn, 1400 acres in woods, roads, and waste grounds.

The quantity of cotton which this extent of ground yields is from 800 to 1000 bales of clean cotton, of 400 lbs. each. The most fertile soils of the uplands produce a bale of cotton to the acre, and the bottom-lands of the Mississippi, a bale and a half in dry seasons. Good authorities, however, consider that the average produce of the cotton lands east of the Mississippi is scarcely 200 lbs., or half a bale, to the acre.

The cotton seed to which the fibre is attached resembles a small bean in shape. It is commonly estimated that 1500 pounds of seed cotton, as it is picked from the husk, will yield 400 lbs. of fibre, and 1100 of seed. An enormous quantity of seed is thus raised, if we reckon the total cotton crop of the United States. The seed is used, in the Southern States, both for feeding cattle and for manure. Several mills have also been erected for extracting its oil; but the trials have not been successful, as the oil is found difficult to purify. I often saw large quantities of cotton seed in the fields for

manure. Some planters estimated the cotton seed as worth nearly £4 a ton for manuring Indian corn or cotton. The cotton seeds are easily destroyed by being buried a few inches below the surface of the ground, and they rot when covered by the plough.

Indian corn does not average more than 25 bushels to the acre on the best soils of this plantation. The hot and moist climate is by no means so favourable as that of the North for its production. The whole quantity raised on the 400 acres devoted to this crop scarcely suffices for what is required by the negroes and the working animals. About 70 mules are almost constantly employed throughout the year, besides 36 yoke of oxen for draught. Eight or ten of these animals are frequently seen in one waggon; and 5000 lbs. is the utmost weight they can draw over the bad roads of the neighbourhood.

The fine upland cotton soils of the State of Mississippi have the great defect of being unsuited to the growth of good grasses for pasturage. The same may be said of the land in the cotton region in the States of Alabama, Georgia, Florida, and the Carolinas. This circumstance renders the cotton lands easily exhausted, and of little value unless under crop. There are no good perennial grasses native to these soils, and none have yet been found that grow well upon them. The chief grasses are annuals, which spring up in summer with great luxuriance in the cotton fields; but in winter their withered stems impart a thriftless appearance to the country. The growth of annual grasses in the fields is a peculiarity of American farming. In the uplands, crops of hay are got by ploughing a field in summer, and merely harrowing it smooth.

The Bermuda grass (*Cynodon dactylon*), a native of the valley of the Ganges, is the most valuable one for the Southern States, though it does not mature its seeds. Owing to this, it is difficult to obtain a sward, which can only be done by breaking up the land where it has got possession, and by planting small pieces of sod, and these spreading, soon fill the ground. It must have the full blaze of the sun for its growth, and perishes in the shade of other plants. On rich land it

is cut three times during summer, and has been known to yield eleven tons of hay to the acre in one season.

The bitter or black coco grass (*Cyperus hydra*) soon fills the ground when encouraged, and forms a pretty good pasture in summer; but it is a fearful pest to the cotton and sugar planter. In fact, when the uplands are infested with this grass, they are useless for cotton, though they may be profitably kept in pasture. It is not indigenous, and its native country has been the subject of dispute. Some suppose that it was brought by the slaves from Africa to Louisiana for medicinal purposes. It has already spread over Texas, and along the rich soils of the lower parts of the Mississippi and its tributaries. In every case in which it has taken an extended flight, it has been traced from New Orleans, where it abounds in the nurseries; and the seeds becoming attached to the roots of fruit trees, have spread the nuisance far and wide. It propagates itself both by seeds and roots; and ultimately fills the land with hard black nutty roots, so that it is considered almost impracticable to eradicate it. The sugar-planters spoke of it with the greatest abhorrence, as some of the rich bottom lands of the Mississippi are ruined by being overrun with it.

The red and white varieties of clover grow well on ordinary soils. The red is sown in September or October, at the rate of a bushel of seed to every six acres; but nothing else is put into the land. It is in bloom by the end of March; but cannot be grazed after the beginning of May, as it then salivates the stock. It is curious that white clover has the same effect on stock in this climate, which renders both varieties of little value for pasturage, but chiefly for enriching the land. Gypsum has a favourable influence on these crops in this region, as in the greater part of North America.

Drilled corn, cut green, affords good forage for cattle and mules; but it requires to be tended in summer, when the whole force of the plantation is directed to the culture of cotton; and though sometimes made into hay, it is troublesome to dry. The cattle throughout the cotton regions fare poorly, and have a starved appearance.

Hay is always a high-priced article in Louisiana, as well as in all the States bordering on the Gulf of Mexico. The common price at Natchez is £5 per ton, and this year it was selling at £13. It is mostly brought down the river from Tennessee, Kentucky, or Missouri, and forms a considerable traffic.

Wheat is cultivated to a limited extent in the State of Mississippi. The census returns give the total number of bushels at 13,990 in 1850. The variableness of the winter climate, and the rapid increase of heat and moisture in spring, encourage rust and other diseases. It is rarely cultivated on the rich uplands, and never on the bottom lands. On the cotton plantations I observed a good many patches of Egyptian oats, affording some pasturage for cattle. The seed is sown in September, and the crop is ready to cut by the first week of May, after which a crop of pease or Indian corn may be got from the same land. Pease and beans, according to all accounts, thrive well in the South; and some of the varieties, such as the cow-pea, produce an enormous quantity of green vegetable matter, as their growth is extended over the whole summer.

The value of the best cotton plantations on the uplands of Natchez is about £4 per acre, which is little more than half of that which soils of similar quality are worth in Canada West. The bad grazing qualities of the land in the Southern States detract much from their value, as the pastures are comparatively worthless. The renovation of the land, too, after it is exhausted by cropping, is not easily effected, the process being here greatly slower than in the fine grazing lands of Kentucky and Tennessee.

In the neighbourhood of Natchez I met a young cotton planter who was driving a pair of fine horses in his buggy. He had lately returned from California, where he had been successful at the gold diggings. He expatiated on its fine climate, and would have gone there if he had been allowed to take his slaves. I had an invitation to go and see his plantation on the river bottoms, which he maintained were so much superior to the uplands, that he would not cultivate the latter though he got the land for nothing. This year he

had given up the culture of cotton entirely for that of Indian corn, considering that the latter, at a dollar and a quarter a bushel, would pay better than any other crop. Having a large extent of uncleared land adjoining the river, he was cutting it down for the steamers; and his slaves, who were good wood choppers, would yield him £166 each during the year.

February 22, 1855.—I got on board a steamer at Natchez for New Orleans, this afternoon, and found it full of passengers, and the accommodation as good as in the one in which I had ascended the river. Calls at different plantations were frequently made to take in cotton and sugar. As many as forty labourers, one-half Irishmen, the other half negroes, are kept on board to save time in taking in the produce of the plantations. During the night we left the cotton plantations behind, and the sugar again occupied the rich bottom lands on both sides. Next afternoon I was landed in the parish of St. James, where I had an introduction to a planter, and I had no more to do than to walk over the bank into the comfortable mansion of a French family, from whom I had a kind reception.

Adjoining the river the soil of the Mississippi bottoms, consisting of a sandy loam, is very fertile; but at a little distance it is a tenacious clay, abounding in vegetable matter, which gradually increases as we recede from the river, until the peaty soil of the swamp is reached. The drainage of the land is imperfect, and nothing but the open-ditch system is followed. The general slope of the land from the bank of the river to the swamp is about eight feet to a mile, which is no more than sufficient for drainage where the surface is somewhat irregular. I saw a number of Irishmen employed by a contractor in digging drains. They were on piece-work, earning fully six shillings, English money, a day, and were provided with board besides. High as their wages are, this kind of work could not be done so cheaply by slave labour, as a negro would scarcely do more than dig one-half the extent of drains which an Irishman does. The Irish labourers return to the North during the warm season, when the sugar

plantations become unhealthy for whites, more especially for those who labour with their hands in the fields.

In sailing on the Mississippi, one is led to believe that the condition of the negroes is much better on some plantations than on others, if it may be judged of from the appearance of their huts or cabins. On one plantation the cabins appear well white-washed and tidy; on the next, dirty and dilapidated. The cottages on this plantation were roomy and nicely whitewashed, and the floors raised about three feet from the ground. Each family had a small garden with a pigsty, and fowl-house on the top, in one of the corners. The negroes had many privileges, and could easily save considerable sums of money, which enabled them to purchase tobacco, tea, and fancy clothing for Sundays. Negroes of the strongest class are required in the culture of sugar; and about three-fourths of a pound of bacon is the common allowance for an able-bodied negro, with Indian corn *ad libitum*. The food is all cooked in one kitchen. I was told by the overseer that the negroes were not treated well on some plantations; and in running over the particulars of his own management, he stated that his negroes "were fed three times a-day," as if the Cuba fashion of feeding only twice were practised on some estates.

The negroes are generally tasked up to their strength during the crushing season, when some planters, I was told, work them on the Sundays as well as other days of the week. However, I believe it is quite the exception to work on Sunday. The grinding season commences in the end of October, and lasts till the end of December. It cannot be prolonged over a greater period with advantage, as the cane is not ripe sooner than the end of October, and frosts are apt to set in with severity by the first of January. The leaves of the sugar-cane are as susceptible of frosts as those of the potato, and if the juice is frozen, the constituents are so much changed that the sugar does not crystallize. The quantity of sugar that can be produced on the Louisiana estates is limited by the number of hands that can be turned out during the crushing season, to carry on the harvesting and the manufacture. But during the rest of the year, especially in July, August, and September, there being no pressure of work on the sugar

estates, the negroes are put on task work, and usually leave off working for their masters early in the afternoon.

The value of land and slaves in the sugar districts of Louisiana, shows the hold which slavery has upon the industrial resources of the country. In 1854, the negroes, old and young, on several estates that changed hands, brought £208 (1000 dollars) a head, but the price had now fallen to £166. The high price of slaves has not had the effect here as in Cuba, of depreciating the value of land, for it had also been steadily rising. Land on this part of the Mississippi is worth from £12 to £17 an acre, and uncleared land having an easy access to the river, £10. A cotton plantation opposite Natchez was lately sold at £19 an acre, but this was considered too high.

The crops on this plantation were, 800 acres in sugar cane; 450 Indian corn; 200 hay and pasture. About two-thirds of the cultivated land is constantly in sugar cane, and as only one crop is got from the ratoons, one-third is planted every year. I saw the negroes planting the last field for this season; it had lately been ploughed and laid off in furrows six feet apart, into which the negroes were laying three rows of sugar canes. The canes, which had been stored in a heap in the field and covered with straw, were cut into lengths of 18 inches by a heavy knife and then slightly covered with earth. Shoots soon spring up from every joint, and the earth is gradually ridged up to the roots of the plants by the plough, and hand-hoeing is required to keep the weeds in check. These wide furrows serve to drain off the immense quantity of rain which falls in summer. By the first of August the cane fields exhibit an immense mass of vegetation of the most luxuriant character. On rich land the first year's cane grows to the height of 12 feet, but about three feet of the top is so watery, that it is not worth crushing. The stubble or ratoon cane is less luxuriant, but the juice is richer in sugar. It is a mere make-shift to allow the cane to stand for the third year on land which has been for some time in cultivation. This is sometimes done, however, by going over the fields and putting in fresh cane where the old roots have given way. In Louisiana and all the Southern States, only two crops are

got from the cane before it requires to be planted afresh. Cane has been cut the fifth year on newly cleared land, but in this case the growth is small. Rich land prolongs the life of the plants, and dressing with guano has the same effect. This manure is now largely used on the Louisiana sugar plantations. I saw a person who had applied thirty tons last year, and was to double the quantity this season. Guano appears to be applied with more advantage to sugar-cane than to any other crop cultivated in the South. Experiments have shown that 400 lbs. of this manure applied to the stubble cane increases the yield by thirty per cent; the crop also ripens earlier; and by repeating the application, an extra crop of stubble cane has, in several instances, been obtained. This fact is a most important one, as the frequent planting of the cane renders its culture more expensive than in the West India Islands, where, on medium soils, it usually lasts for eight years, and takes one acre of cane to plant four acres. Sugar-cane is only cultivated on the rich alluvial soil along the banks of the Mississippi, and the land fit for the crop is very limited. Some planters say its extent could only be slightly increased by encroaching on the swamps, which, being inferior in productiveness, are easily exhausted.

After having so lately seen the manufacture of sugar in Cuba, I was pleased with the arrangements of the sugar-house on this plantation. The sugar is fully refined, and greater economy is followed in every department of the process. The engineer, an Englishman, was paid £15 : 10s. per month for superintending during the grinding season; but he looks over several other estates at the same time. The sugar master and all the other inferior functionaries were negroes, who were, from the trust which was committed to them, evidently possessed of considerable skill and intelligence.

The crushed cane, or "begasse," is of little use to the Louisiana planter for fuel, owing to the moistness of the climate during the grinding season. At one time the swamp betwixt every frontage on the river furnished abundance of fuel; but now the wood is all cut down on some estates, and recourse must be had to the drift-wood of the river or the crushed cane. On several plantations the planters keep

a man or two constantly gathering the wood that floats down the river. I saw large erections for drying the crushed cane to render it fit for burning. The gradual exhaustion, also, of the land from such severe cropping is causing some of the planters to use the begasse for manure, though it is found somewhat difficult to incorporate it with the soil.

The common yield of sugar in Louisiana on an acre of land well managed is about 1700 lbs. of sugar and 60 gallons molasses. The ordinary produce of this plantation was 1400 hogsheads of sugar, 1000 lbs. each; and 2000 barrels of molasses. From 200 to 300 cords of wood, worth twelve shillings a cord for fuel to the river steamers, are required to manufacture this quantity of sugar.

The cotton plant does not succeed well so far south as the parish of St. James on the rich lands of the Mississippi bottoms. It grows to the height of twelve feet, but rust and worms are so destructive to the crop that it rarely yields more than 200 lbs. of fibre.

Indian corn likewise will sometimes grow to the height of fifteen or eighteen feet on new lands, but the produce of grain is comparatively small. I was told that not more than thirty bushels an acre can be got on the best managed fields, and that the average produce in the sugar lands was not more than fifteen bushels. The hot moist climate is not favourable for this crop, and no encouragement is therefore offered to cultivate more of it than is actually required for home consumption.

It is often warm during the day in winter in Louisiana, but the trees are slow in showing signs of reviving vegetation. Indeed, vegetation here requires a higher temperature to stimulate it into growth than in our northern latitudes. It is, perhaps, for this reason, that the white clover, considered by American botanists to be a native of Europe, is now more advanced than any of the pasture plants. The coco grass, however, which is such a terror to Southern planters, had been brought up by a few warm days, but it was cut down by the sharp frosts. The Bermuda grass had not begun to spring. It is much valued for hay on the Missis-

sippi bottoms, and yields, in two cuttings on ordinary land, about four tons of hay.

On this plantation, 20 yoke of oxen and 110 mules are required for cultivating the land. A good many sheep and cattle feed in the pastures and swamps. The value of the land, machinery, working animals, and slaves, amount to a large sum. I heard that many of the planters are deeply in debt. The planter whom I visited informed me that he had a loan of £40,000 from one house in London, for which he paid six per cent, and considered it very moderate; and enormous sums are also said to be held in mortgage by English and Northern capitalists in Louisiana.

After spending a day very agreeably in St. James's parish, I returned to New Orleans and again visited some friends to whom I was formerly introduced. One day I met a very intelligent planter, but with some eccentricities of character, who gave me a distinct account of the formation of the delta of the Mississippi and the cotton zone of the south. After an hour's conversation, he said that he was obliged to go away on some business. At length he told me that he was going to buy three women for his plantation, and if I wished to have a peep at the "dark side of slavery," I might go with him, and see how they manage such matters. To this I willingly assented, and setting out together we soon arrived at one of the "trader's" booths. Before entering, he cautioned me not to say a word, but merely to listen. The dealer was a short thick man, very illiterate apparently, and from the horrid conversation which ensued as we inspected his "lot," I could scarcely believe that it was real. There were about sixty slaves in the room, which resembled a country school with its forms. As soon as we entered they were ordered to stand up, and they arranged themselves into four classes—the men on one side and the women on the other. The tallest stood at the top, and there was a regular gradation to the shortest at the foot. The most of them were from Virginia, and seemed anxious to get masters. "Buy me, master, I am a good field hand, and can work at anything," was addressed to me by every one on whom I cast my eyes; and I have no doubt they must find the confinement irksome. The

prices asked were from 900 to 1300 dollars, but no bargain was made. At the top of one class stood a woman with a child in her hand, and who was pregnant, and had been separated from her husband in Alabama.

Slavery, I must confess, was never brought home to me in a form so repulsive as at this exhibition. I was glad when I got into the street. It is surely worth the serious consideration of those who are so deeply interested in the institution to devise means by which the transference of slaves from one master to another might be accomplished with more decency. I have heard some of the most zealous advocates of slavery freely express the same wish. Are the churches become so weak as to be unable to lift up their voices against the separation of husband and wife?

Those who palliate or excuse instances of the separation of husband and wife, say that it seldom takes place unless either party has been guilty of a criminal offence. But slaves, when innocent, have no legal protection against such an injustice, and it is actually done daily. So far as the feelings of the slaves are concerned, the American slave-laws furnish a good illustration of Adam Smith's doctrine, that the slave is less contemptible in the eyes of his master under arbitrary than under free governments. All must admit that the spirit of the American laws is exceedingly harsh to the slave. But Mrs. Stowe explains this by observing that, "It has been a problem to many how the system of slavery in America should unite the two apparent inconsistencies of a code of slave-laws more severe than that of any other civilized nation, with an average practice at least as indulgent as any other; for, bad as slavery is at the best, it may yet be admitted that the practice, as a whole, has been less cruel in this country than in many. *An examination into history will show us that the cruelty of the laws resulted from the effects of indulgent practice.*"

A circumstance that pleases one in travelling through the Southern States is, that all parties are anxious to impress upon you that the slaves are in general humanely treated, and that "Uncle Tom" is a gross exaggeration of the state of Southern society. In almost every company I entered, this celebrated

book became the topic of conversation. My defence of it was that it is a capital story, and that Mrs. Stowe had taken no more liberty with facts than novelists usually do; and if such instances of cruelty as she portrays really occurred, why not expose them to the light of day, and use every means to prevent their recurrence? To this I never got any other than a courteous answer.

We may despise the churches that allow certain practices to exist within their pale, but they have served to diffuse and maintain sentiments of humanity, which have been the means of softening the lot of the slave. Had the religious element been weaker than it is in the South, "Uncle Tom" would not have been so much felt. In Cuba I found no one possessing slaves that owned Mrs. Stowe any grudge; but some, who had immense powers delegated to them, entirely scoffed at the religious aspect of the question, and told me that it was now only entertained by "women and fanatics." It is hopeful when slave-owners do read the Bible, as it forms a good directory for dealing with those who are so much in their power. The religious element has so far acted on public opinion as to have induced more humane treatment throughout the country; and it is the only element to which we can look for further improvement.

Not only is the standard of the treatment of slaves regulated by a sort of public opinion among the planters, but the laws are held subordinate to this opinion. In fact, the spirit of Judge Lynch prevails generally in the South; for it does not matter much what the law may be, as it is not enforced unless it harmonizes with the sentiments that prevail. As an example, I may relate an anecdote told me by a Mississippi slave-owner. One night he learned that an Irishman was about his premises; and as this was not the first offence, he loaded his gun with slugs, and went out and fired at the fellow as he was endeavouring to make his escape, and wounded him severely. For this act he was taken before the local court, charged with assault and battery. The presiding judge heard the case attentively, and gave judgment that the accused should stand his trial at the assizes. But this

sentence was only the easiest way of dismissing the case ; for no sooner did the judge deliver it, than he turned round to the assaulted party and addressed him in a low voice, " You blackguard, had it been myself, I would have shot you through the heart." The case was allowed to drop. On stating to him the evils that must flow from such a state of matters, he replied to the effect that, in present circumstances, it was the system best calculated to protect society.

CHAPTER XVI.

NEW ORLEANS TO WASHINGTON.

February 23, 1855.—I left New Orleans for the North this afternoon by the railway, which runs to Lake Pontchartrain, and there getting on board a steamer, reached Mobile early next forenoon, where I remained till next day. There is only one handsome street in the town, the houses of which are built in the English style, with abundance of shrubs in the gardens. The leaves of the orange and other evergreen trees were blasted by the frosts. The houses of the main street are built with bricks; and, except a new hotel, none of them attract attention. The large slave population renders the suburbs mean and untidy. Mobile appears to be stationary, and this is not to be wondered at, as the yellow fever often rages with great virulence in summer, and perhaps the quantity of cotton cannot be much increased in the country drained by the rivers that find an outlet to the sea through the Bay of Mobile.

It was Sunday, and the town was quiet, though numbers of idlers were standing at the corners of the streets. In the Southern States the temperance party are making efforts to introduce the Main Liquor Law, and they seem to be stronger in the small towns than in the country. In Mobile they have shown their strength by closing the gin-shops on Sunday, and this was the first day that the new regulations came into force. The experiment did not seem to be quite successful in preventing drunkenness, for I saw many persons the worse of liquor. One fellow came staggering into the hotel, and on asking him how he managed to get spirits since the shops were shut, he replied that he had

bought half a gallon last night, with which he treated himself and friends this forenoon. The shutting of the gin-shops on the Sabbath in the towns of the South may not have all the beneficial effects which the temperance party anticipate, still it must be viewed as a favourable symptom of the progress of sobriety and decency. All accounts concur in representing that a great improvement has taken place within the last ten years in the drinking habits of the better classes, and their example evidently extends to the lower.

The east bank of the Alabama at Mobile is a vast swamp, covered with reeds where the tides overflow it, and by a dense forest a little further north. The west bank, upon which the town is built, is the tertiary sands of the pine barrens; and here, as along the whole shore of the Gulf of Mexico, it is covered with the long-leaved pine. The soil of these tertiary sands is of a very sterile character, and little of it is cultivated.

I took my passage in one of the cotton steamers, in the afternoon of the 25th February, for Montgomery, Alabama, which I reached after a sail of fifty hours. The water in the river being still low, owing to the protracted drought, the steamer ran great risk of being "snagged;" and, indeed, an accident of this kind had occurred two days before. The speed of the vessel was always slackened over the shallows, and as we stuck several times on sand-banks, our progress was far from rapid.

The scenery on the Alabama is of the most uninviting and monotonous character; for the river has cut a narrow channel, from two hundred to three hundred yards in width, through beds of clay, gravel, sandstone and limestone shale. The banks, in many parts, are precipitous, exposing the whole strata to view; in others, more sloping, and covered with trees and tall canes. There are no rich bottom-lands on the Alabama, and, unless one mount to the top of the banks at the landings, no idea can be formed of the nature of the country.

During my sail up the Alabama, I had proof of the extremely cold weather to which these low latitudes are occasionally subject, even in the end of February. In the after-

noon, when I left Mobile, the mud in the streets remained hard frozen in the shade. At sunrise, on the 26th and 27th, the thermometer stood at 22° , while it only rose to 32° and 30° at noon, on these days, with a bright sky. A breeze prevailed from the north, and the dripping springs on the south bank were converted into solid masses of ice.

Among the passengers was a planter from Marengo county, situated in the western part of Alabama, nearly half way betwixt the shore of the Gulf of Mexico and the northern boundary of the state. The soil of this county, he stated, rests upon the cretaceous formation, and is very fertile. It was thinly wooded in its natural state, but covered with canes, which were from twenty to thirty feet high. These "cane brakes" were easily brought into cultivation, by being fired in winter, which so thoroughly cleared the ground that a scratch of the hoe was only necessary for putting in the first crop of Indian corn, and no more labour was bestowed upon it than to keep any cane shoots in check which might spring up from the old roots during summer. The "cane-brake soils," in fact, are always spoken of as possessing great natural fertility. I observed cattle browsing on the leaves of the cane, which is almost the only green food to be seen in winter. It must be allowed to grow freely in summer; for it rapidly dies out if the leaves are plucked off at that season. The scarcity of winter food for cattle is a great obstacle to the rearing of them in the Southern States, as well as to the improvement of the land when it becomes exhausted.

The soils in Alabama, with respect to natural capabilities, are similarly arranged to the soils in Georgia and the Carolinas. The region adjoining the Gulf of Mexico, as already remarked, is composed of the tertiary sands which are known as the pine-barrens. The middle region in Alabama is principally occupied by the cretaceous formation, which yields fertile soils. By looking to the agricultural map, it is seen that the most of the cotton in Alabama, as in Georgia and the Carolinas, is grown in this middle region. The northern part of these States is occupied by primary rocks; the surface is hilly, and there are many fertile valleys; but the

climate is unsuited to the culture of cotton. A glance at the agricultural products, and at the social state of each of these three zones, affords us material for obtaining a knowledge of the circumstances which favour the extension of slave labour, and those which favour that of free.

I may here mention that I met a German settler in the steamer on the Alabama, on his way to Philadelphia, in pursuit of a runaway female slave, who had managed to get on board a vessel at New Orleans bound for that northern port. He had telegraphed to an agent in Philadelphia, and considered that his property was quite safe. Along with a number of his countrymen, he had emigrated some years ago, and settled on the uplands in Yazoo county, Mississippi State. This district is quite in the heart of the cotton zone, and when the settlers arrived, they obtained land at the Government price, and, by cultivating cotton, soon found themselves in a prosperous state.

From the fact just mentioned, I think that had negro slavery never been introduced into the Southern States, a considerable quantity of cotton might now have been raised by free labour on the dry and healthy soils of the cotton zone. But it is difficult to imagine how this could take place under any other than the small-farming system, which is less productive of this staple than the organized labour of slaves on large estates.

This German settler confessed that nearly all his countrymen who emigrated with him were now slave owners. They were poor on their arrival in the country; but no sooner did they realize a little money than they invested it in slaves. Thus those who flee from the despotism of European governments, commonly find the temptation to possess slaves so strong, that almost all do so as soon as it is in their power. This is the process by which poor immigrants who settle upon moderately fertile land in the Southern States, quickly come into a possession of considerable property. To obtain the first slave is the prime difficulty; for the possession of one seems to afford security for obtaining another on credit. This was the German's statement, which was corroborated a few day's afterwards by a slave dealer whom I met, who told

me that on receiving payment in cash for one slave, he generally gave another on credit.

I may mention that the greatest calamity which befell the friends of my German fellow-passenger, since their arrival in the country, was the pestilence of 1853. After the yellow fever had committed great ravages that year in New Orleans, it spread over the northern part of the State of Mississippi. The account he gave of the panic which prevailed in Yazoo city was frightful. More than half the inhabitants fled into the interior. He was seized by the disease, and during his illness there was scarcely a neighbour in a fit state to give any assistance. On his recovery, he found that more than a third of the population that had stayed behind had been carried off by the pestilence.

If these German immigrants had settled on the poor soils of the pine barrens, it is not probable that they would have been holding slaves. Their own labour would have been so much less productive, that it could not have enabled them to purchase slaves. Neither could slaves have been hired in and employed in the raising of cotton on soils so poor. It is worthy of remark, however, that a good deal of cotton is cultivated throughout the pine barrens, and the larger portion of it seems to be raised by free labour. The climate of the pine barrens, it may also be kept in mind, is even warmer than that of the middle cotton zone, which is more elevated. This shows that, had there been no means of obtaining slaves, a considerable quantity of cotton might have been produced on small farms by free labourers, because the fertile soils would certainly have been preferred to the barren, and the climate of the upland cotton zone is not so hot and moist as to have precluded the application of free white labour to the culture of cotton.

At the same time, it must be confessed, that a given number of slave population on the large plantation system will produce, in the present circumstances of the country, a much greater quantity of cotton than the same number of free. As already stated, the slaves, male and female, work in the fields, and their numbers admit of that organization and division of labour which render slavery so serviceable in

the raising of cotton. If the climate had admitted of the growing of cotton on both banks of the Ohio, we should have seen that slavery possessed as great advantages over free labour in the raising of this crop as it does in that of tobacco.*

The rich upland soils of the cotton zone afford a profitable investment for capital, even when cultivated by slaves left to the care of overseers. The natural increase of the slaves, from two to six per cent, goes far to pay the interest of the money invested in them. The richest soils of the uplands are invariably occupied by the largest plantations, and the alluvial lands on the banks of the rivers are so unhealthy for white labourers, that slave owners occupy them without competition. Thus, the banks of the western rivers are now becoming the great cotton-producing districts. Taking these facts into consideration, it appears that the quantity of cotton which would have been raised without slave labour in the United States, would have been comparatively insignificant to the present supply.

The comparative density of the free and of the slave population, under the different circumstances of soil and climate to which I have alluded, will be rendered sufficiently plain by a few returns taken from the census. By obtaining accurate views of the principles involved in this matter, we shall cease to wonder at the slow progress of the Southern States.

The county of Washington, Mississippi State, lies between the Yazoo and Mississippi rivers. Its area is about 1520 square miles, and the soil is chiefly alluvial, though a considerable portion is swampy and liable to be flooded. It affords a striking instance of the influence of fertile and unhealthy land in favouring the preponderance of slave population over free. The numbers, in 1850, were—

Free	.	.	.	.	.	553
Slave	.	.	.	.	.	7836

In the same year, this county produced 26,178 bales of cotton; 424,600 bushels of Indian corn. This gives $3\frac{1}{3}$ bales of cotton for every soul reckoned in the census; and if we only allow eight cents a pound for the cotton, this would give £22 sterling as the net return from every slave. We need

* See Chapter viii.

not follow these figures any farther; for we obtain at once a view of the productiveness of slave labour, where circumstances are so favourable as in this case. But I shall now select another instance, to show an opposite state of things.

The county of Coffee, having an area of 900 square miles, in the southern part of Alabama, and adjoining Florida, is only forty miles north of the waters of the Gulf of Mexico, and its surface is little more than one hundred feet above the level of the sea. It is intersected by several rivers, and all the dry soil belongs to the tertiary sands of the pine barrens. The poverty of its soil renders slave labour unprofitable, and therefore compels the "poor whites," who are called "crackers," to cultivate the land with their own hands. The returns of the census of this county are, therefore, in strong contrast to the county of Washington, Mississippi. The produce, in 1850, was 1408 bales of cotton, 136,610 bushels of Indian corn, and 65,863 lbs. of rice. And when we bear in mind that the soil is of the poorest description, and that this produce must be gathered over a comparatively large area, the greater part of it must be raised by free labour, for the population, at the same date, consisted of—

Free	.	.	.	.	.	5383
Slave	.	.	.	.	.	557

But this disproportion betwixt the numbers of slaves and freemen in the pine barrens is reversed when we take any of the fertile counties in the centre of Alabama. Thus, Marengo county, having an area of 1166 square miles, and where the celebrated "cane-brake lands" cover a large portion of its surface, produced, in 1850, 32,295 bales of cotton, 1,242,460 bushels of Indian corn, and 94,540 bushels of oats; and the population was then—

Free	.	.	.	.	.	7,138
Slave	.	.	.	.	.	20,693

On the other hand, in Northern Alabama, where the elevation of the country renders it unsuited to the growth of cotton, the great majority of the population, as in the Northern Slave States, which are not suited to the growth of tobacco, are freemen. Thus, Hancock county, bordering on Tennessee, having an area of 600 square miles, traversed by the high

ridges of the Blue Mountains, is not favourable to the employment of slave labour, though its valleys are said to be fertile. The produce, in 1850, was 26 bales of cotton, and 39,624 bushels of wheat; and the population—

Free	:	:	:	:	:	1480
Slave	:	:	:	:	:	62

The influence of the adaptation of the soil for different agricultural systems on the disproportion betwixt the numbers of the free and slave population, is seen in all the cotton-growing states. In Georgia and the Carolinas, the three zones—the lower, the middle, and the upper—are scarcely less marked in their effects on the social condition of the inhabitants than they are in Alabama. Three counties, selected from the three zones in Georgia, may be taken in illustration.

Irwin county, in the pine barrens, in 1850, produced 89,000 bushels of Indian corn, 112 bales of cotton, and 37 hogsheads of sugar. The population was:—

Free	:	:	:	:	:	2884
Slave	:	:	:	:	:	450

Jones county, in the centre of the State, and producing 9006 bales of cotton and 402,360 bushels of Indian corn, had a population consisting of—

Free	:	:	:	:	:	3945
Slave	:	:	:	:	:	6279

Gilmer, bordering with Tennessee, and having a hilly surface, and a considerable population engaged in mining; the numbers in 1850 were:—

Free	:	:	:	:	:	8240
Slave	:	:	:	:	:	200

On the narrow belt of land along the coast of the Carolinas, upon which the sea island cotton grows, the slave population greatly preponderates. The culture of rice on the tidal swamps in these States being entirely confined to large plantations, favours the excess of slaves. As I have formerly shown, when treating of rice culture, the population of Beaufort district, S. Carolina, consists of—

Free	:	:	:	:	:	6526
Slave	:	:	:	:	:	32,279

The value of slaves, being regulated by the produce of their labour on the fertile soils of the cotton zone, cannot be

profitably employed in raising cotton on the sterile soils of the pine barrens. This immense tract of land, forming a broad fringe to the Southern States east of the Mississippi, is a barrier to the extension of slavery. Poor as the soil is, it is still capable of supporting a considerable population under a system of small holdings; and I do not think that it can ever be cultivated by slave labour. On the other hand, also, it is unprofitable to maintain slaves on the wheat and Indian corn lands along the flanks of the Alleghany mountains in Alabama, Georgia, the Carolinas, and Virginia, where tobacco is not raised. Thus the slave population being hemmed in by the highlands on one side and the poor soils of the coast on the other, is confined to the middle belt which I have laid down on the map as the cotton region.

In travelling through a fertile district in any of the Southern States, the appearance of things forms a great contrast to that in similar districts in the Free States. During two days' sail on the Alabama river from Mobile to Montgomery, I did not see so many houses standing together in any one spot as could be dignified with the appellation of village, but I may possibly have passed some during the night. There were many places where cotton was shipped and provisions were landed; still there were no signs of enterprise to indicate that we were in the heart of a rich cotton region. Nor is this to be wondered at, for American slavery, in its most productive state, has all the worst features of absenteeism, more particularly where the plantations are managed by overseers. In fact, the more fertile the land the more destitute is the country of villages and towns. And how can it be otherwise? The system of management which is recommended as the most economical and profitable, is to raise and to manufacture on the plantations every thing which the slaves require. Though this is seldom accomplished, yet a great part of the clothing is home-made; and the chief articles imported are bacon and mules from the Northern States. The only article sold is cotton, which is conveyed to the nearest point on a navigable river, and consigned to a commission agent in the exporting town; while the bacon all comes in through the same channel. Of such articles as are in daily use among the rural inhabi-

tants in the poorest districts of the Free States, the slaves are a non-consuming class. An element so essential to rural prosperity is in a great measure wanting in the Slave States, and thus few villages are seen. The planters supply themselves with their own necessities and luxuries of life directly through agents in the large towns, and comparatively little of the money drawn for the cotton crop is spent in the Southern States. Many of the planters spend their incomes by travelling with their families in the Northern States or in Europe during the summer, and a large sum is required to pay the hog-raiser in Ohio, the mule breeder in Kentucky, and, above all, the northern capitalists, who have vast sums of money on mortgage over the estates. Dr. Cloud, the editor of the "Cotton Plant," assured me, that after these items are paid out of the money received for the whole cotton and sugar crops of the south, there did not remain one-fourth part of it to be spent in the Southern States. Hence the Slave States soon attain a comparatively stationary condition, and further, the progress they make is in proportion to the increase of freemen, whose labour is rendered comparatively unproductive, seeing that the most fertile land is pre-occupied by slave-owners.

When the valued exports and imports of any of the Southern States are compared, it is found that the former invariably exceed the latter, in consequence of the want of a consuming class. The commerce of a few of the principal towns that export the cotton crop may be taken as illustrating the condition of Southern society. It is a common theme for the Southern politicians to lament the want of enterprise among the merchants in conducting a foreign import trade. "One of the chief drawbacks to New Orleans," says Mr. Robb, an influential gentleman in that city, "is the absence of an import trade; and why are we without imports? Why is it that a city exporting 80 or 90 millions of dollars annually, is so insignificant in that important branch of commerce? *Because of the remoteness and uncertainty of our markets, or being without a speedy, rapid, and cheap communication with the interior country that seeks New Orleans as a market for its agricultural productions.*" But the truth is, there are

few imports required, for every Southern town tells the same tale. In 1851, the valued exports at Mobile were 14,555,366 dollars, and the imports only 620,892 dollars. This town, with the exception of New Orleans, exports more cotton than any other in the union. In 1852 the valued exports at Charleston were 12,899,620 dollars, while the imports were only 1,767,343 dollars.

The imports of Charleston in 1820 were nearly equal to one-half the exports, but now are only about one-seventh. This evidently indicates that the condition of the whites of South Carolina has not been improving. Perhaps the lowering of the status of the free population by the division of properties among families, has so far contributed to this result. Free labour also, as we have already shewn, is very unproductive when applied to the cultivation of the soil in the Slave States, for it is virtually excluded from the fertile lands, and can therefore purchase comparatively few of the luxuries of life.

The commerce of the Northern States furnishes a great contrast in regard to the amount of exports and imports. They show that there are stronger bands holding the Northern and Southern States together than any which politics are likely soon to break. Not a little of the great prosperity of the Northern States is owing to the labour of the slaves, which is as productive as any in the United States. As Adam Smith has pointed out, labour applied to the culture of the soil is always doubly valuable in new countries; and were we to deduct the produce of the labour of the slaves from the industry of the United States, it would be a comparatively poor country. This forms no excuse or palliation for the existence of slavery. The Northern States should bear in mind, however, that protection to manufactures serves to add strength to the fetters of the slave by withdrawing labour from the cultivation of the soil, and fostering an unnatural condition of things. The value of the exports of agricultural produce raised by free labour is little more than a third of that raised by slave. The leading articles of export for the fiscal year 1852, were :—

Though slavery impoverishes the Southern States, it enriches the Northern. Almost every traveller from the old country is struck with the numbers of Southern planters and their families frequenting the hotels in the Northern States. It is in the South that the Ohio farmers find a ready market for their bacon and mules, which products require comparatively little labour; and the northern capitalists, who hold such vast sums in mortgage over slave plantations, are in reality absentees of the Southern States. These circumstances serve to explain how the imports so greatly exceed the exports in the Northern towns. Thus in 1852 the valued imports and exports at Philadelphia and New York were—

	Imports.		Exports.
Philadelphia,	14,785,917 dollars.	.	5,828,571 dollars.
New York,	127,441,394 „	.	71,523,609 „

Until the institution of slavery be weakened, as it was in Europe, by the redundancy of the predial population, I have as little hope of slavery relaxing its grasp in the United States for many years to come as of people denying themselves the luxuries of cotton, sugar, and tobacco. I have failed to discover a single element in active operation which points to a different conclusion. At a moderate estimate, the slaves in the United States are worth, at the present moment, £450,000,000. This is sufficient to show how firm a hold the institution has upon the vested interests of the country. No scheme of emancipation has been proposed that would not be attended with a sacrifice of property which it is vain for us to expect to be made. Thus slavery, I fear, will not loosen her grasp till labour, which is at present obtained by coercion, can be otherwise commanded through the force of circumstances.

The most hopeful fact connected with this subject is, that the area capable of being profitably cultivated by slave labour in the United States is not so great as is commonly supposed. And were no new territory to be added to the federal dominions, slavery would before long be confined to only the most fertile lands in the South. Professor Tucker of Virginia, and others, greatly overrate the capabilities of the Southern States of supporting a slave population. Delaware, Maryland, Kentucky, Virginia, and Tennessee, seem to have

all nearly obtained their full complement of slaves. The Carolinas and the States bordering on the Gulf of Mexico possess but a small area of good land in proportion to their extent. South Carolina, for example, containing about 21,000,000 acres, is as fertile as the average of those just mentioned ; yet there are little more than four million acres improved, and there are only about a million and a half in cultivation. Besides an immense extent of swamps, there are six million acres of pine barrens, which, though capable of being cultivated in small farms, cannot be profitably cultivated by slave labour. Florida, nearly as large as England, consists almost entirely of pine barrens and swamps, and never can sustain a dense slave population. Texas, I believe, contains a considerable extent of unoccupied sugar land, which is no doubt capable of maintaining a dense slave population ; but the interior is poor, and many of its cretaceous soils are not suited to the growth of cotton.* The vigour of slavery in the Northern Slave States depends less upon the money value of the slaves than upon the obtaining of an outlet for their natural increase, which otherwise would soon act as an incubus on landed property, in the same manner as a redundant population has in some of the strictly agricultural counties in England. As soon as the value of slaves reaches a low sum in Virginia, in consequence of the Southern demand falling off, cheap and abundant labour will be readily commanded, and the value of land will rise as that of slaves falls. If the Mississippi had formed the boundary of slavery on the west, perhaps Maryland and Virginia might have been free long before now, and Kentucky and Tennessee, in their turn, would soon have been forced to abandon the institution. But as to the time when the void beyond the Mississippi is likely to be filled up by free and slave immigrants, it is difficult to form an opinion. If Walker succeed in establishing himself in Nicaragua, the effects will be far more disastrous to the cause of freedom than the admission of Kansas as a slave State. His triumph

* Though the rich "cane brake soils" of Alabama rest upon the cretaceous formation, they do not generally contain a large percentage of calcareous matter. Where they do, the cotton plant will not thrive. Great tracts of Texas, it is said, abound in calcareous matter, and are unfit for cotton.

over the Costa Ricans will be equivalent to the annexation of that part of Central America to the federal dominions. This would prepare the way for the occupation of the valley of the Amazon, to which some are already looking as an outlet to the surplus slave population of the United States. If the surplus slave population is to overflow into the tropical latitudes, the prospects of freedom are truly melancholy. The opponents of slavery in the North should strongly resist the acquisition of new territory to the federal dominions, and I never scrupled to argue with the Southern planters that Englishmen were actuated by the same sentiments which led them to emancipate their slaves in the West India Islands in desiring to see slavery confined within its present limits, and to die out in the United States.

Throughout the South, vigorous attempts have been made to employ slave labour in cotton factories. On the whole, the experiments would seem not to have been successful, though the accounts I received were various. An intelligent New Englander, who had spent the winter in the South, informed me that he had made particular inquiries into the subject, and had found that the slave factory system was in a declining state. The reasons he gave were, that the purchase of slaves involved too much capital, and the hiring of them in by the month or the year was attended with great inconveniences. It would really be a sad thing if the surplus labour of the slave population were to overflow into such channels. But experience has so far demonstrated that free labour is not only more productive and economical, but far more convenient. In fact, slave labour has no advantages over free in the factory system where there is a pretty numerous class of poor whites. It seems also that this kind of employment is not, like field labour, considered demeaning to the white female population. The following appeal on this subject, by a Southern gentleman, will show the feeling that prevails:—"It is not only the benefit to be derived in a direct manner to the individual manufacturer that holds out a strong inducement to the South to go largely into cotton-spinning, nor yet alone the prospect of enriching a community as a body. Motives of humanity and philan-

thropy enter into the calculation, and these should not be disregarded. This is a subject on which, though it demands attention, *we would speak with delicacy*. It is not to be disguised that a degree of poverty and destitution exists in the Southern States, among a certain class of people, almost unknown in the manufacturing districts of the North. The poor white man will endure the evils of pinching poverty rather than engage in servile labour under the existing state of things, even were employment offered him, which is not general. The white female is not wanted at service; and if she were, she would, however humble in the scale of society, consider such service as a degree of degradation to which she could not condescend; and she has therefore no resource but to suffer the pangs of want and wretchedness. We know from personal acquaintance and observation that poor Southern persons, male and female, are glad to avail themselves of individual efforts to procure a comfortable livelihood in any employment deemed respectable for white persons. They make applications to cotton mills, where such persons are wanted in numbers much beyond the demand for labour.”—(*De Bow's Review*).

Slaves are worth more in the South than in the North; but crude white labour is, owing to the want of employment, virtually worth less in the South than in the North. Where slave and free labour come into fair competition, as they do in the Southern factories, free labour will be well rewarded if it merely obtain an amount of remuneration equal to the hire and maintenance of a slave on the cotton plantations, which regulate the value of slave labour in the South. The poor whites having comparatively few sources of employment open to them, will work for even less wages than the hire and maintenance of a slave. This tends to prevent slave labour being extensively employed in cotton factories.

I reached Montgomery, the capital of Alabama, on the night of the 27th February, and started early next morning by the train for the east. The temperature was several degrees below the freezing point, and a thick hoar-frost covered the ground. I got out of the train about six miles to the east of the town; and leaving my portmanteau in the

house of one of the plantation overseers, walked about eight miles to the south to visit Dr. Cloud, the editor of the "Cotton Plant." The soil in this district is far from being rich, and the most of the plantations I passed were small. The usual number of working hands was from six to twelve, but in some cases there were even fewer. Small plantations, as has been already pointed out, are invariably found on the secondary descriptions of land.

The soil in the neighbourhood of Montgomery rests upon the cretaceous formation, which is succeeded by the primary, a few miles to the eastward. While the soils over the immense area of the granitic formations in the New England States and the British Possessions are stony and poor, the larger extent of the same class of rocks in the south are covered by soils of moderate fertility. This arises from the fact that the primary rocks in the Southern States having decomposed *in situ*, and not having been subjected to denudation, afford an immense depth of clay and sand. The primary and tertiary soils have a considerable resemblance to each other in lithological character. The surface soil on both formations is often somewhat sandy, from a foot to a foot and a half deep, and contains only a small quantity of vegetable matter. It is remarkable, that the subsoil consists of a siliceous clay, which is thus covered by the sandy soil over an area as large as the whole of England. The geological question arises, How could such an immense stretch of country have become covered with this thin stratum of sand, while the subsoil is so opposite, and, at the same time, homogeneous in its character? I remarked to Dr. Cloud that it had apparently arisen from the washing away of the clay out of the surface soil by the rains, the sand, which the clayey subsoil contained in abundance, being left behind. I have since observed, however, that Sir Charles Lyell discusses some interesting phenomena connected with the geology of Alabama and Georgia; and the peculiar features of the soil and subsoil which I have just described may assist in supporting certain views he puts forth respecting the condition of the surface of the country as it was gradually raised above the ocean.

Sir C. Lyell alludes to the singular phenomenon in the neighbourhood of Milledgeville, in Georgia, of gneiss and mica schist decomposed *in situ* to an immense depth, and also to the surprising extent of some of the modern ravines excavated by the rains since the country has been cleared of timber and cultivated. One of these measured no less than 55 feet in depth, 300 yards in length, and varied in width from 20 to 180 feet; yet, strange to say, twenty years before it had no existence. The walls of this chasm consist of "beds of clay and sand, red, white, yellow, and green, produced by the decomposition *in situ* of hornblendic gneiss, with layers and veins of quartz, as before mentioned, and of a rock consisting of quartz and felspar, which remain entire, to prove that the whole mass was once crystalline."

"I infer, from the rapidity of the denudation caused here by running water after the clearing or removal of wood, that this country has always been covered with a dense forest, from the remote time when it first emerged from the sea. However long may have been the period of upheaval required to raise the massive tertiary strata to the height of more than 600 feet, we may conclude that the surface has been protected by more than a mere covering of herbage, from the effects of the sudden flowing off of the rain water."

"I know it may be contended that, when the granite and gneiss first rose as islands out of the sea, they may have consisted entirely of hard rock which resisted denudation, and therefore we can only affirm that the forest has been continuous from the time of the decomposition and softening of the upper portion of these rocks. But I may reply that similar effects are observable, even on a grander scale, in recently excavated ravines, seventy or eighty feet deep, in some newly cleared parts of the tertiary regions of Alabama, as in Clarke county, for example, and also in some of the cretaceous strata of loose gravel, sand, and clay, in the same state at Tuscaloosa. These are at a much greater height above the sea, and must, from the first, have been as destructible as they are now."

This, it appears to me, is sound reasoning. In fact, as these tertiary beds were gradually raised above the sea, they

were quickly covered by land plants, which protected their soft surface from denudation by rains, a process which is now found, in many regions, to take place to a great extent where the land is brought under the plough. Might not the sandy surface soil which covers such an immense area have formed the beach as the waters retired, the clayey particles being then washed out by the tides and waves of the sea?

Pines are the chief trees in the forests where the sandy soil prevails; but when it approaches more to a loam, oak and hickory also make their appearance. In all cases in which the soil has been washed and exhausted, the hard-wood trees, as under the same circumstances in the Natchez uplands, cease to spring up; but pines occupy the ground. This fact furnishes another instance of the influence of the physical condition of soils on the growth of different kinds of trees. Betwixt Montgomery and Atlanta, in Georgia, oak and hickory predominate in many places in the natural forest; but none of the land seemed to be at all equal in natural fertility to the uplands of Natchez.

Dr. Cloud's plantation is about 800 feet above the level of the sea. He was sanguine that the soil in his neighbourhood admitted of great improvement by ploughing deep and bringing up a portion of the clayey subsoil to the surface; and the cotton plant is said to be productive on such land when well manured. But the radical defect of the soils, in this district as well as throughout the cotton region in Georgia and the Carolinas, is their unfitness for growing good grasses. This renders the raising of stock of all kinds expensive; and when the fields are allowed to lie waste for some years to recruit their productive powers, they are, during the time, in a great measure worthless. On some of the waste lands here the grasses were from two to three feet in height; but their hard siliceous stems had been untouched by cattle in summer, and, being now dry and withered, imparted a most thriftless aspect to the country.

Agricultural information is well diffused among cultivators in the United States. All of them, both in the North and South, read agricultural papers, and the matter of one journal is commonly transferred to the others. A great uniformity of

management thus prevails, where the soil and climate are similar. Horizontal cultivation is as universal in Alabama as it is in the uplands of Natchez, where it was first adopted. The compact subsoils here cause washing, and the rapid deterioration of the natural capabilities of the land ensues, unless it is naturally level or laid carefully off in level ridges. I was well pleased at the skilful manner in which a negro, with one mule in his plough, was drawing horizontal ridges, of about four feet in width, on a slightly undulating field. Little wheat is yet raised at this elevation above the sea; one small field, of about an acre, was on the plantation; the frosts at night were keeping it in check; but it was about six inches in length, and would be ready for harvest by the end of May, and a crop of Indian corn might be afterwards got.

Having spent an agreeable and instructive day with Dr. Cloud, I left early next morning for the railway, and making a signal for the train to stop, got into the cars for Washington, a distance of upwards of 900 miles. This journey occupied three days and three nights. The appearance of the country was most monotonous. The soil about Atlanta seemed to be poor and shallow, and cotton, wheat, and Indian corn are grown upon the plantations, where the elevation is 1000 feet above the level of the sea. After reaching Branchville, in South Carolina, I got upon the line by which I had gone south—then swamps and pine-barrens to Virginia.

At Charleston I gathered, from a good, easy-looking fellow that sat on the seat in front of me during the last long stage, that he was a "trader." He seemed to have no more shame of his calling than if he had been a dealer in horses. He turned off at Branchville for Columbia, and I was somewhat sorry that I had not picked up a talking acquaintance with him a little sooner, so as to learn the particulars of his mode of doing business; for he was by no means backward in giving information. He had been south with a lot of fifty slaves, whom he sold in Georgia. At the same time, he mentioned that it was against the laws of that State to import any more slaves; but such laws were not regarded. It had taken about three months to sell that number. He said that he rarely got cash for one slave without giving another on credit; and he did

not charge his customers more than six or eight per cent interest. According to his account, the profits of the trade must be considerable ; for he did not think it was good payment unless the slaves yielded him 200 dollars a-piece, besides the expenses. This he confessed, however, he did not always get. A slave dealer is very much looked down upon, even in Southern society ; and this may account for the high profits of the trade. This corresponds pretty well with the answer which a waiter in my boarding-house at Washington gave me when I asked his price :—" Eight hundred dollars here, sir, and one thousand at New Orleans."

The dreary journey through the pine barrens was enlivened by the conversation of a gentleman from one of the Northern States, who had spent the winter in the higher parts of Alabama and Georgia. He had been selling instruments of various kinds, and having disposed of his whole stock, had made a successful trip. As an instance of the bad feeling that exists towards Northerners, even in the upper districts of these States, where free labour predominates, I may mention that he had found it expedient to travel under the guise of a Southerner. After we had talked for sometime together, I asked where he resided, and he, imagining I belonged to the South, replied, " New Orleans." But as soon as he knew that I was from England, he told me that he had only said so to me as he had done everywhere in the South, for the purpose of ingratiating himself with his customers ; for had he told them he was from the North, he would have been set down as an Abolitionist, and have done no business. He gave a sad account of the state of the poorer class of whites in these parts, both as regards knowledge and morality. Slavery seems to put a stop to the diffusion of education among the poor whites throughout the South. In the lower country they are thinly scattered over the sterile soils of the pine barrens ; and the general ignorance of the parents in the grain regions along the flanks of the Alleghany mountains, makes them attach no value to the education of their children. The large towns in the South, where society is exclusive, and in a great measure destitute of the public spirit that prevails in the Northern States, have not aided in promoting educa-

tional institutions for the benefit of the poorer whites. Thus, in South Carolina, the number of schools, in 1849, was 1023, and the number of scholars, in a population of 250,000 whites, was only 9112. North Carolina exhibits a similar want of education among the whites. According to Mr. Wheeler, her own historian, *one* out of every *seven* white persons over twenty years of age could neither read nor write; and by the United States census of 1850, there were 71,150 white persons over twenty years of age in that state of ignorance. Every philanthropist, therefore, must regret the introduction of slavery into Kansas; for as it is very improbable that Kansas can ever support a dense slave population, slavery will form an incubus on the moral and physical advancement of the country.

At Washington I remained about a month, and during that time was occupied in studying the climate of America, and writing a few lectures on that subject, which I had been requested to deliver at the Smithsonian Institution. These lectures were published in the Appendix to the Secretary's Report to the Regents, and the concluding chapter on the climate of North America is an extension of the views which were then sketched out. Leaving Washington on the last day of March, I returned to Boston, stopping some days in Philadelphia and New York. Sailing from Boston in the *Asia*, on the 13th April, I arrived at Liverpool, having been nearly nine months from home.

CHAPTER XVII.

CLIMATE OF NORTH AMERICA.

Tropical Winds.

“NOTHING can equal the beauty and mildness of the climate,” says Humboldt, “of the equinoctial region on the ocean. The charm of the lovely climates bordering on the equator can be fully enjoyed only by those who have undertaken the voyage from Acapulco, or the coast of Chili, to Europe in a very rough season. What a contrast between the tempestuous seas of the northern latitudes and the regions where the tranquillity of nature is never disturbed! In the passage from Santa Cruz to Cumana, as in that from Acapulco to the Philippine Islands, seamen are scarcely under the necessity of working their sails. We pass those latitudes as if we were descending a river, and we might deem it no hazardous undertaking if we made the voyage in an open boat.”*

Within the Tropic of Cancer, this tranquil state of the ocean exists on the Atlantic from the African continent to 60th degree of west longitude. The north-east trade winds blow there with great regularity, and storms are rarely experienced. In order to understand the agents which impart such diversities to the climate of Europe and of North America, it is necessary to take a cursory view of these winds and the theory of their action.

It is well known that the north-east trade winds of the Tropic of Cancer and the south-east trade winds of the Tropic of Capricorn blow obliquely towards each other. The space that intervenes betwixt these two opposite winds forms a broad belt at the equator, where it is almost constantly calm, and where it rains almost uninterruptedly. “Old sailors tell

* Travels, chap. iii.

us," says Lieut. Maury, "of such dead calms of long continuance here, of such heavy and constant rains, that they have scooped up fresh water from the surface of the sea."

The existence of this belt of equatorial calms, towards which the north-east and south-east trade winds are constantly blowing, indicates that these winds ascend in this region and flow back as upper currents towards the poles. It is also especially worthy of observation that, notwithstanding that the south-east and north-east trade winds are constantly blowing towards this calm and rainy belt, the *barometer at a mean is about one quarter of an inch lower there* than it is on the outer edge, or polar limits of the trade winds. On the other hand, at the polar limits of the trade winds, the mean height of the barometer is greater than at any other part of the earth's surface.

By looking at Plate 1st, it will be seen that the limit of the trade winds in both hemispheres is about the 30th parallel of latitude, where two belts of calms also exist—the calms of Cancer and of Capricorn. The atmospheric conditions existing in these two belts are entirely different from those in the belt of calms at the equator. There the sky is generally without a cloud, rains are very rare, the barometer stands above the mean; and it is moreover evident, when the facts are fully considered, that there must be a descent of air from the higher regions of the atmosphere to supply the north-east and south-east trade winds. This proposition, first propounded by Espy, and now generally assented to by men of science, forms a part of his beautiful and simple theory of the trade winds. Not only must there be a descent of air in the belts of high barometer—the calms of Cancer and Capricorn—sufficient to supply the trade winds, but sufficient to supply the winds that blow towards the poles in the extra-tropical latitudes of both hemispheres. The south-west wind, for example, has been shown, by the valuable labours of Maury, to prevail on the Atlantic, north of the calms of Cancer, with wonderful regularity during summer. And in the southern hemisphere, the north-west wind springs up in the polar border of the calms of Capricorn, and the south-east trade wind on its equatorial border. These facts therefore indi-

cate that there is a descent of air, in the calms of Canear and Capricorn, from the higher regions of the atmosphere, to maintain the high barometer and currents forming the winds which blow from them on both sides.

Espy's Theory of the Trade Winds.

The mean pressure of the atmosphere at the level of the sea varies little throughout the globe. The motions of the air or winds are the effects of agents which disturb the equilibrium of pressure. The law that regulates the motion of water is, that it seeks its level. The corresponding law that regulates the motions of the atmosphere is, that *air, at equal elevations above the sea, flows from a high towards a low barometer.* To this law there are no exceptions—the motions of the air in the sea-breeze and in the hurricane are alike in conformity to it.

In accordance with this law, the north-east and south-east trade winds blow from the *high* barometer in the calms of Canear and Capricorn to the *low* barometer in the calms and rains of the equator. Like air that rushes towards a chimney in which a fire has been lighted, the two trade winds blow towards the equator to restore the equilibrium of pressure. The draft in a chimney is caused by the air being expanded and rendered lighter by the fire; the light air is forced upwards by the colder air on both sides of it.

The latent caloric set free by the condensation of the elastic vapour which supplies the copious rains falling at the equator is the agent that heats the air, and, causing it to expand and flow away above, the barometer must necessarily stand lower than where there is no precipitation.

It must be kept in mind that the amount of caloric which is set free in every inch of rain that falls, is capable of heating the air from the bottom to the top of the atmosphere to the extent of 10 degrees. This fact has been clearly established by the independent researches of Espy and of Regnault. The condensation of vapour in the belt of rains and low barometer has effects precisely similar to those which would take place were the trade winds to contain a certain quantity of inflammable matter, which was ignited on reaching this zone of low barometer.

The *ascent* of the trade winds in the belt of low barometer at the equator is *the cause of the copious rains*. The law which determines the precipitation of rain, when air saturated with moisture ascends from the surface of the earth to the higher regions of the atmosphere, was discovered by Dalton. It is now well known that when air saturated with moisture is suddenly expanded, its temperature falls, and it cannot maintain the same quantity of vapour. A deposition of moisture is the consequence. Moist air ascending from the surface of the ground, and thus coming under less pressure, expands, and becoming colder, precipitates a part of its vapour as clouds and rain. Rains are chiefly produced by the ascent of air. That rain must necessarily be produced when moist air is forced from the surface of the ground to the higher regions of the atmosphere, the facts furnished by Mr. Walsh, in one of his balloon ascents from Kew Gardens, may be adduced to prove. At the time of his ascent the barometer stood at 30 inches at the surface of the earth, with a dew-point of 61° , or 6.06 grains of water in every cubic foot. At the height of 18,370 feet the barometer stood at 15 inches; the temperature of the air and dew-point being 7° and $2^{\circ} 8'$ respectively. The quantity of water which could exist in a cubic foot of air at this temperature would be only 0.8 grains. But air at this elevation having its volume doubled by being under half the pressure, the same quantity of air which a cubic foot at 30 inches of pressure would contain, is 1.6 grains of water. Were air, therefore, at the dew-point of 61° , to ascend to the height of 18,370 feet, and to have its temperature reduced to the normal temperature for that height, it would precipitate 4.46 grains of water. On the other hand, were the air to descend from the higher to the lower strata of the atmosphere, it would have its temperature raised and become dry. It is for this cause that clouds are formed when air ascends from a lower to a higher level, and dissolve when it descends from a higher to a lower.

The dry and almost cloudless regions, in both hemispheres, under the parallel of the 30th latitude, arc, as Espy has pointed out, in beautiful harmony with the law regulating the

dryness necessarily arising from the descent of air to supply the winds that blow from both sides of them. The air in those regions being drier and colder in the higher beds of the atmosphere, weighs more, and causes the barometer to stand higher at the level of the sea. On the other hand, the ascent, near the equator, of the north-east and south-east trade winds, occasions the clouded sky, with constant rains, which prevail in that region. The evolution of latent caloric in the formation of cloud expands the air in the region of clouds, and causes it to spread out above and roll away towards the poles. The air being heated in the higher beds of the atmosphere, is rendered lighter by expansion, and consequently the barometer stands lower in the belt of equatorial rains.

If the earth had been at rest, the northern trade winds would have blown from north to south, and the southern from south to north. Air, however, coming from the north in the northern hemisphere, or from the south in the southern, is constantly arriving at latitudes where the diurnal velocity of the surface of the earth is greater, and from the nature of inertia, it will not at once acquire this new velocity; and therefore become a north-east wind in the Tropic of Cancer, and a south-east wind in the Tropic of Capricorn.

Some have objected to Espy's centripetal theory of storms, on the ground that the barometer should rise in the centre of storms if the winds were to blow towards it. But the belt of low barometer and rains at the equator, to which the north-east and south-east trade winds are constantly blowing, demonstrate the truth of the principles upon which the theory is founded.

Influence of the Belt of High Barometer in Africa.

It would appear that the belt of calms, which occurs about the 30th latitude, is often maintained over continents, with its attendant phenomena of high barometer and cloudless skies. This is more especially the case when there are large masses of land on both sides of the belt. The north of Africa, for example, is crossed by the calms of Cancer, and it is well known that in summer no rains fall. The soil, as in

Egypt, is only rendered fertile by the irrigation which the rivers afford. Even the south of Europe obtains so scanty a supply of summer rains, that few summer crops are raised except by artificial irrigation. Thus the Indian corn lands of Spain are almost entirely confined to its irrigated valleys. It is also worthy of observation, that it is in the rainless belts of high barometer guano deposits are found—the droppings of sea-fowl being preserved where little rain falls.

The Belt of High Barometer does not usually exist in the proximity of the North American Continent.

Espy justly remarks that “the wind at the surface of the earth, in the temperate zones,” (and I may add in the tropical zones) “cannot blow towards the belts of high barometer, but, on the contrary, must blow from them;” that is to say, that a northerly wind cannot blow across the calms of Cancer from the northern temperate zone, nor a southerly wind across these calms from the tropic of Cancer, if the barometer constantly stands higher there than on both sides of it. Because, at equal elevations, air can no more flow from a lower towards a higher barometer, than water can run up hill. Wherever this belt of high barometer is maintained, it acts as a wall in preventing the winds of the temperate zone from crossing into the tropical.

In the Atlantic Ocean, beyond the influence of the continent of North America, the calms of Cancer with their clear sky, low dew-point, high barometer, and winds blowing from them on both sides, afford a fine example of the regularity and permanence of the aerial phenomena in those regions. But it is a fact well worthy of the attention of meteorologists that the nicely adjusted forces which exist in the belt of high barometer on the middle of the Atlantic, are usually absent in the proximity of the American continent. For it is well known that both southerly and northerly winds blow across the 30th latitude with great violence, that the sky is often obscured with clouds, and rains are abundant. Indeed, the atmospheric phenomena of the Caribbean Sea and Gulf of Mexico form a remarkable contrast to those of the same latitudes in the mid-Atlantic and north of Africa.

It appears that west of the 60th degree of longitude the winds in the Tropie of Cancer are frequently from the south-east, and crossing the 30th latitude, flow over the continent of North America as southerly winds. The eurving of these winds, in the Caribbean Sea and Gulf of Mexico, in their course across the 30th latitude, and how they diffluse themselves over the continent, is sketched in Plate 1.

It is a curious fact, that an examination of Mr. Redfield's charts, representing the course of storms in this region, shows that few or no storms cross the calms of Caneer east of the 60th degree of longitude. Betwixt this longitude, however, and the western shores of the Gulf of Mexico, is the gateway through which the hurricanes and American winter storms are supposed by Reid and Redfield to drift from the West India Islands northwards over the American continent. Indeed, without a broad aerial current, such as we have indicated in Plate 1, a vast body of air in a state of *rotation* could not be *translated* over the course which has been laid down by these advocates of the rotatory theory of storms. This, Mr. Redfield so far admits, for he justly observes, "That the progression of rotatory storms is caused by the predominating current in which they are imbedded appears nearly a self-evident proposition, and there is much evidence of the prevalence of aerial currents which correspond to the courses pursued by the several storms." * He further allows that the fertility of the American continent arises from the copious rains brought by the winds from the Caribbean Sea and Gulf of Mexico. This latter view, however, seems to have been first adopted by Volney, an outline of whose opinions I shall now give, as they refer to the current which forms such a distinctive feature in the climate of those parts; for the warm south wind from the Gulf of Mexico is not only the source of fertility, but the great disturbing element in all seasons of the year.

Volney's Views.

The physical geography of North America has a most important influence on its climatology. An almost unbroken chain of mountains extends from the Isthmus of Panama

* Hurricanes of the Atlantic, etc., p. 110.

northwards, as far as the Arctic Circle. This comprehends the Rocky Mountains of North America, having an average height of from 10,000 to 12,000 feet; the mountains in the interior of Mexico attaining an elevation even greater; and the high lands of Central America, which, however, are not above 5000 feet. Two important breaks occur—the one at Lake Nicaragua, near Panama, and the other at the Gulf of Tehuantepec. At both these places the elevation of the land which separates the two oceans is inconsiderable.

This vast natural wall acts as a complete barrier to the easterly trade winds, which, as Volney first pointed out, do not cross into the Pacific Ocean. This observer also showed that it deflected these winds, and caused them to take a course parallel to its direction. He has stated the question so lucidly, that I cannot do better than give his own words.

“Mariners,” says Volney, “relate that from Cape Vela, a projecting point of the Gulf of Maracaybo, the winds vary and swerve into a course parallel to the stream which flows into the Caribbean Sea. On entering the bay of Honduras it veers a little, and blows from the south-east. The bank of sand called Yucatan is interposed between the two bays, but it is so low and level that it is no obstacle to its progress. Bernard de Orta, who has published some useful information on the winds of Vera Cruz, tells us, that south-east winds prevail in those parts.”*

Volney further remarks that the trade winds are at length deflected by the table-land of Mexico and Rocky Mountains, so that they become south winds in passing over the northern parts of the Gulf of Mexico, and form the south winds of the Mississippi valley. These views are fully borne out by observations.

Mr. Phelps, in a communication to Dr. Henry, secretary of the Smithsonian Institution, writes, with regard to the winds at Fort Brown in Texas, on the Rio Grande, 26° 10' north latitude:—“The prevailing winds at Fort Brown are from the *south*, or probably from a point or two *east of south*. This is more particularly the case during the spring and

* Volney's View of the Soil and Climate of United States.

earlier part of summer. At that season, they are usually pretty constant, especially during the day time, blowing at the rate of fourteen miles an hour, or upwards of five degrees of latitude per day. They always bear along with them large masses of glowing clouds, called 'gulf clouds' by the people of Texas."

Owing to the direction of the table land of Mexico, the south-east winds of Vera Cruz thus become the south winds on the Rio Grande. These winds, in conformity with Volney's views, are found to prevail with great constancy in the States and Territories west of the Mississippi river. Professor Coffin, in his admirable treatise on the "Winds of the Northern Hemisphere,"* referring to the line of military forts which extend from Texas to Minnesota, says:—"The most peculiar feature in this region is the line of southerly winds on the western borders of Arkansas and Missouri. *It seems to form a connecting link between the winds of this zone and the south-easterly ones that we find south of it.*"

Rains in the United States.

In consequence of the continent of North America being powerfully heated by the rays of the sun in summer, the southerly winds are more prevalent during that season. This fact is well established by the researches of Professor Coffin. The United States and Canada thus owe their fertility to the abnormal course of the tropical winds. These aerial currents, hot and moist from the equatorial zone, after crossing the Caribbean Sea and Gulf of Mexico, flow northwards in summer over the continent almost with the regularity of a monsoon. Indeed, from the Gulf of Mexico to the British Possessions in America, the country is liberally watered by summer rains. There is no break about latitude 30° in this vast rainy region. Unlike the climates of corresponding latitudes in Europe and Africa, the West India Islands have their hurricanes and their luxuriant cane-fields; the Mississippi Valley its summer tornadoes, and its cotton and maize fields. The following

* "Smithsonian Contributions to Knowledge."

observations even show that latitude 30° is the most rainy on the American continent:—

	Latitude.	Rain in Inches.			
		Spring.	Summer.	Autumn.	Winter.
Louisiana, New Orleans.	30° 0'	10.3	17.4	10.1	15.6
Alabama, Mobile.....	30°42	12.6	19.3	12.1	16.9
Florida, Key West.....	24°33	6.5	9.2	11.5	4.5
Georgia, Savannah.....	32°05	11.9	23.4	9.7	8.4
Missouri, St. Louis.....	38°37	12.1	13.3	9.2	7.1
Ohio, Cincinnati	39°06	11.3	9.8	8.5	13.4
New York, Rochester... .	42°45	7.	8.9	9.1	5.6
Minnesota, Fort Snelling.	44°58	6.8	10.2	5.7	2.0
Maine, Gardiner	44°10	10.6	10.3	10.5	10.1

The summer rains usually fall in thunder showers during sultry weather. The autumn rains are sometimes protracted for a day or two. The winter rains and snows are accompanied with violent winds and great fluctuations in the barometer. The winter storms sweep the whole continent east of the Rocky Mountains. At all seasons the rains and snows are preceded by southerly winds from the Gulf of Mexico. But in winter these warm and moist winds are invariably succeeded by cold winds from the west, which render the fluctuations in the temperature of the most extreme character. I think that the principal phenomena of the American storms can be accounted for by the action of these two winds—the south and the west. The cold wind in Canada and the Northern States is usually from the north of west, in the latitude of Washington from the west, and on the shores of the Gulf of Mexico often due north. The manner in which the two winds—the south and the west—of the most opposite characters, alternately displace each other, involves the whole theory of American storms.

Mode in which the South displace the West Winds.

Before proceeding with our illustrations on this subject, I shall give Mr. Phelps' graphic description of the effects of the

“northerners” of Texas displacing the warm winds from the Gulf of Mexico. Writing from Fort Brown on the Rio Grande, in latitude $26^{\circ} 10'$, which is as near the equator as Thebes in Egypt, he says:—

“To show the character of the ‘northerners,’ an extract from my diary will suffice. *February 27, 1851.*—Until this moment, a quarter past 5 P.M., the wind has been blowing from the south for sixty hours, bearing along large masses of clouds, at a rate, to all appearance, of at least thirty miles an hour. But now, while we are weltering from heat and dust, the wind changes in an instant. The weather-cock jumps round from the south to the north; the cold wind whistles through the key-holes and crevices; down comes the rain, and we are making haste to kindle a fire upon the hearth. At 3 P.M. on the 26th February, the thermometer stood at 84° ; at a few minutes before, the norther at 70° ; but at 9 o’clock on the morning of the 28th, it was down to 36° . Duration of this norther, forty hours. It blew a stiff breeze from the time it set in. Rain of short continuance. Northerners are always preceded by a wind from the south for several days, during which *the barometer falls, and the thermometer rises until the moment in which the norther comes.* The norther is explosive, like a thunder gust, instead of driving a large body of warm air before it, as might be supposed, coming with all its coldness suddenly and at once. During northerners, ice occasionally is seen in tubs and other vessels to the thickness of several inches.”

The climate of the American continent is characterized by great and sudden changes in temperature during the colder periods of the year. As stated in the sixth chapter of this work, I was surprised at the sudden change of the weather on the 10th November 1854, when at Galena, in Illinois, near the Mississippi river. I have, therefore, selected the weather, during a few days about that time, to show how the warm and cold winds, with all their attendant phenomena, are propagated over the continent.

On the 9th November 1854, the weather was warm and moist for the season over the whole country to the west of the Mississippi. On the same day, however, it was unusually

cold and dry throughout the Atlantic States. For the purpose of showing that the state of the weather could not in any way be ascribed to the influence of the sun, I have left out of view the readings of the temperatures during the day, and only taken those observed at sunrise and at 9 P.M.

WEST OF MISSISSIPPI.				ATLANTIC STATES.			
		Sunrise.	9 P.M.			Sunrise.	9 P.M.
	lat.	Deg.	Deg.		lat.	Deg.	Deg.
Fort Brown,	26°10'	72	75	E. Florida	30°15'	60	63
Fort Smith	35°30'	52	64	N. Carolina	36°20'	33	38
Missouri	38°37'	44	59	Vermont	44°29'	23	22
Fort Snelling	44°53'	42	58	Montreal	45°32'	14	25

At Fort Brown on the Rio Grande the wind and clouds were from the south throughout the 9th, but no rain fell. At Fort Smith, in Arkansas, the south wind was high from 10 A.M. to 8 P.M., and bearing clouds from the same quarter all day. The wind was also S.E. in Missouri. At Fort Snelling the sky was overcast and the wind from the south. At 11½ A.M., the wind was very boisterous, with thunder. One-third of an inch of rain fell from noon to 9 P.M. I well remember the beautiful day which I spent on the banks of the Mississippi, near Galena, on the 9th, with a warm wind from the south, and a shower in the afternoon.

The distance from Fort Brown on the Rio Grande, to Fort Snelling, near St. Paul's, on the Mississippi, is about 1400 miles in a direct line. Still we have traced the southerly wind throughout the whole extent. The comparatively high temperature during the morning and evening over this region was only an illustration of the scripture proverb, that "out of the south cometh heat."

It is worthy of particular notice that the *barometer was below its mean throughout the whole extent traversed by the southerly wind on the 9th November.*

In the Atlantic States, on the 9th November, the winds were westerly or northerly (generally from the north-west) and the temperature was low and the sky almost free from clouds. The *barometer also stood above the mean throughout the Atlantic States on the 9th November.*

Indeed, if the temperatures had been put down on a map as observed throughout the United States on the 9th, one

could scarcely have failed in coming to the conclusion that a southerly wind was blowing west of the Mississippi. It is altogether difficult to imagine, on any other supposition, how such a high temperature could exist there on that day, seeing the weather was so cold two days previous. We are not left to conjecture, however, for direct observations show that an aerial current, about 600 miles in breadth, was flowing from the Gulf of Mexico, and raising the temperature of the air over the territories to the west of the Mississippi. The arrows indicating the directions of wind on the 9th, and the figures the temperatures, are laid down in Plate 2, at a few stations on the small chart of the weather at sunrise.

It may be here observed, also, that since the cold weather prevails over such large tracts of the American continent, the *change* from cold to warm weather must be much less sudden in the North-Western territories than from hot to cold—the north-west winds at once lowering the temperature. Thus, as Fort Snelling, in Minnesota, is about 1400 miles from Fort Brown, in Texas, on the Rio Grande, the warm air at the southern station could only be translated to the northern in thirty-five hours, though it travelled at the rate of forty miles an hour. Owing to this cause, we need not wonder that the south winds are very cold on the Illinois prairies for the first day they blow. In these regions, the thermometer therefore, usually rises much slower than it falls, and it will also be found that the barometer rises much faster than it falls.

But, on the 10th November, some very remarkable changes took place. At Fort Snelling, in Minnesota, the most northerly and westerly station, snow seems to have begun to fall at 1 A.M., and continued till 8 A.M. The temperature fell from 58° at 9 P.M. of the 9th, to 22° at sunrise of the 10th. At two stations in Iowa, west of the Mississippi, the temperatures also fell to 27° and to 24° . St. Louis, in Missouri, being farther to the eastward than Fort Snelling, the temperature was 46° at sunrise, but fell to 35° by 9 P.M. Though Fort Smith, Arkansas, is about 700 miles distant from Fort Snelling, and about one degree of longitude further west, yet the *change of temperature and wind seem to have been simultaneous*

at both places ; for at 1 A.M., a thunder storm with wind and rain burst over Fort Smith, and *the thermometer fell 21° from 9 P.M. of the 9th to sunrise of the 10th.* But at Fort Brown the wind still continued from the south, with the temperature 73° at sunrise, and 85° at 3 P.M.

The observations show that the westerly and northerly winds had displaced the warm winds from the south in the territories to the west of Fort Smith and Fort Snelling. Hence the great lowering of temperature which ensued. How the one wind displaces the other will be afterwards discussed ; in the meantime we shall only direct attention to the facts.

But whilst the southerly wind was losing ground west of the Mississippi on the 10th, it was gaining ground to the east. At the same time, however, the whole Atlantic coast from South Carolina to Maine was remarkably cold at 7 A.M. of the 10th. The southerly current, from 600 to 700 miles in breadth, occupied the Central States, and flowed hotter and moister from Louisiana to Michigan than it did in the same latitudes to the west the previous day. The sketch in Plate 2 represents the region swept by the south wind or tropical drift current on the morning of the 10th November.

Indeed, we would scarcely hesitate in inferring that a southerly wind was prevailing to the east of the Mississippi, and maintaining a high temperature, if we were asked to give an explanation of the extraordinary contrast which the temperatures of the weather of 10th November presented, as given below :—

WEST OF MISSISSIPPI.		MIDDLE STATES.		ATLANTIC STATES.	
	Deg.		Deg.		Deg.
Fort Snelling	22	Fort Brady	37	Maine	11
Iowa State	24	E. Illinois	56	Washington	34
Fort Smith	44	Mississippi State	66	N. Carolina	35
Fort Brown	73	W. Florida	72	E. Florida	61

The barometer was below the mean over the entire region swept by the south wind, from Alabama to Michigan.

The lowering of temperature made considerable progress in the North-Western States on the 10th, for the westerly and northerly winds displaced the warm current which prevailed in Illinois and Indiana the previous day. On the other hand,

the Atlantic coast was swept by the southerly wind on the morning of the 11th, and the temperature was consequently raised. Thus—

WESTERN STATES.		ATLANTIC STATES.	
	Deg.		Deg.
Fort Snelling . . .	16	Maine . . .	47
Fort Brady . . .	31	Vermont . . .	53
Illinois . . .	25	Massachusetts . . .	57
Missouri . . .	31	New York . . .	59
Fort Smith . . .	33	Washington . . .	63
N. Texas . . .	52	N. Carolina . . .	66
Fort Brown . . .	73	E. Florida . . .	69
		Key West (Reefs) . .	78

The small chart of the weather given in Plate 3 will show the progress which the cold western current had made on the morning of the 11th, as well as that portion of the territory of North America which was then swept by the warm and moist current from the Tropic of Cancer. By the arrows at Key West, one of the Florida Reefs, at the north-east corner of Florida, and at South Carolina, it is seen that the south wind was blowing across latitude 30°, where the belt of high barometer exists in the mid-Atlantic, and sweeping the whole coast of the United States.

It is an important fact that the wind changed to the west at Fort Brown on the 11th. There was, however, little reduction of temperature, though there were heavy thunder showers.

The barometer *rose* in the western States with the cold weather, and *fell* in the eastern with the high temperature and rains.

By the morning of the 12th the cold wind from the west had made considerable progress. In Central Texas the wind was northerly at sunrise, with the temperature down to 38°. At Fort Brown on the Rio Grande the thermometer stood at 45°, having fallen 33 degrees since 9 o'clock of the previous night. A "norther," there is every probability for believing, prevailed in the western parts of the Gulf of Mexico. In this instance, therefore, *the "norther" did not begin to blow at Fort Brown until about 48 hours after the cold winds were felt at Fort Smith in Arkansas, and Fort Snelling in Minnesota.* This is an important fact to keep in mind, as the "northers" have by

many been supposed to *precede* the cold winds of the north-western territories of the United States. The contrast of temperatures existing on the western and on the eastern parts of the United States is still very remarkable on the morning of the 12th November.

WESTERN STATES.		ATLANTIC STATES.	
	Deg.		Deg.
Fort Snelling . . .	12	Maine . . .	54
Fort Brady . . .	16	Massachusetts . . .	53
Iowa . . .	11	New York . . .	57
Indianapolis . . .	30	N. Carolina . . .	58
Missouri . . .	26	Savannah . . .	64
Fort Smith . . .	26	E. Florida . . .	70
Central Texas . . .	38	W. Florida . . .	70
Fort Brown . . .	45	Key West . . .	78

A "norther" at last blew along the north-western parts of the Gulf of Mexico, as far as West Florida, causing a sudden and great reduction of temperature. The warm southerly current, accompanied with a high temperature and copious rains, however, still prevailed in East Florida and in the south-eastern part of the Gulf, extending from the Florida Reefs to the State of Maine, a distance of 1600 miles. The small chart in Plate 3, indicates the regions over which these two opposite currents prevailed on the 12th.

At length, however, the north-west wind reached East Florida on the morning of the 13th November, and caused the temperature to fall to 53° from 69° at 9 P.M. of the 12th, and at night it was down to 47°. As indicating the enormous areas over which corresponding changes of temperature are propagated over the territory of North America, frosts prevailed on the morning of the 13th along the States bordering on the Gulf of Mexico from Texas to Georgia, as well as throughout the whole country northwards to the Lakes. But the southerly current was still flowing over the Atlantic States north of Georgia, and maintaining the high temperature.

WESTERN STATIONS.		EASTERN STATIONS.	
	Deg.		Deg.
E. Florida . . .	53	N. Carolina . . .	62
Savannah . . .	50	Washington . . .	64
Alabama . . .	32	New York . . .	63
Kentucky . . .	24	Connecticut . . .	64
Ohio . . .	33	Massachusetts . . .	62
Fort Snelling . . .	18	N. Hampshire . . .	53
Fort Brown . . .	44	Maine . . .	53

The figures and small chart of the weather for 13th

November bring out the fact that the north-west wind reduced the temperature at sunrise of the 13th both at Jacksonville in Florida and at Savannah in Georgia, while along the coast to the north, the temperature was still higher than it was the day previous. I shall afterwards have occasion to show that a most erroneous interpretation, with regard to the direction in which atmospheric changes are supposed to be propagated, has by many been put upon the fact of the change of the wind and the lowering of temperature taking place sooner in Florida than in Maine.

The reduction of temperature did not take place at Key West until the morning of the 14th, when the thermometer indicated 63°, or 14 degrees lower than the previous morning. But, with the exception of the State of Maine, which was still under the influence of the southerly stream of warm air, the temperature was greatly lowered throughout the Atlantic sea-board. At sunrise of the 14th, the following temperatures were noted :—

	Deg.	
Key West	63	Maine, 53° at 7 P.M., 47° at 9 P.M., and 33° at sunrise of 15th Nov.
E. Florida	39	
Georgia	32	
N. Carolina	35	
Virginia	34	
Washington	33	
New York	39	
Massachusetts	37	

The space over which the southern current is supposed to have extended in the Atlantic, and to have maintained the high temperature in Maine at the same time that the cold winds swept the whole of the coast south of it, is marked in the small chart of the weather of 14th November, in Plate 4.

The “norther,” with its low temperature, was thus propagated along the northern shores of the Gulf of Mexico, as the cold westerly wind progressed in the northern States.

The high barometer, also, extending from the Gulf of Mexico to the Lakes, is propagated along with the cold and dry air. On the other hand, the line of low barometer is nearly co-extensive with the warm and rainy south winds.

A great quantity of rain fell along the Atlantic coast from the night of the 10th to the 13th November. At Springfield, Massachusetts, there fell 4.16 inches ; London, Massa-

achusetts, 4.9 inches; London, Connecticut, $3\frac{1}{4}$ inches; Bloomfield, New Jersey, 1.957 inches; Philadelphia, 2.1 inches; Maryland, 2.1 inches; Alexandria, Virginia, 2.98 inches; Savannah, Georgia, 2.05 inches; Cedar Keys, Florida, 1.4 inches. At the same time as the wind changed to the N.W., a considerable quantity of snow fell in different parts of the United States. But it would be out of place here to enter further into such particulars.

It is thus seen that the rains commenced over the country to the west of the Mississippi, and were gradually extended towards the Atlantic coast, where they were very copious. This quite agrees with Espy's generalization, that "the rain and snow storms, and even the moderate rains and snows, travel from the west towards the east in the United States, during the months of November, December, January, February, and March, *which are the only months to which these generalizations apply.*"

Although Espy has restricted his generalization to the five coldest months, I shall afterwards endeavour to show that there are no good grounds for supposing that similar phenomena are not in operation during the warmer months. That the winter storms travel or are propagated from *west* to *east*, as we have seen was the case in the storm which continued from the 9th to 14th November 1854, are amply borne out by the investigations of Loomis and Espy. Of *two hundred and sixty winter storms* which have been examined by the latter, all began by a long line of low barometer west of the Mississippi, stretching from the Gulf of Mexico to the Lakes. This line of low barometer and atmospheric disturbances was invariably propagated from west to east.

Before shortly stating my views as to the manner in which the rains and line of low barometer are propagated from west to east, I shall attempt to answer some important queries which have been put by Dr. Hare to American meteorologists regarding the restriction made by Espy as to the course which rains follow at different seasons of the year.

Dr. Hare's Queries.

This gentleman is well known to be a great opponent of

the opinions of those who have supposed that storms are vast whirlwinds. With the physical objections he has urged against the idea of rotation and translation of great bodies of air, I quite concur. It is singular, however, that such a distinguished physicist has failed to discover that the error which Benjamin Franklin made is the grand mistake, or blunder, as it may be called, of the rotatory theorists. The following queries of Dr. Hare are quite reconcilable with the fact of the progression of storms being from *west* to *east*.

"9th, Whether, agreeably to the observations of Franklin, and general experience confirming them, our storms producing north-eastern gales do not travel from south-west to north-east?

"10th, Whether their travelling thus does not warrant the opinion that they commence in the Gulf of Mexico, and are propagated gradually to the north-east along the Atlantic States, and the neighbouring portion of the Atlantic Ocean?

"11th, Whether the observations of Redfield do not establish, so far as they are reliable, that certain storms travel from the Gulf along the coast of the United States, and of course from *south-west* to *north-east*, and how these results are to be reconciled with the generalization in Espy's report, or with the evidence adduced by Loomis?

"12th, Whether any absurdity, which Redfield's inferences involve, respecting the interior phenomena of his supposititious whirlwinds, justify distrust of the correctness of the route which they are represented to have pursued?

"14th, How can the observations of Franklin, confirmed by a very general impression that they were sagacious and well-founded, be reconciled with those made by Loomis, also highly esteemed, unless there be two kinds of storms, one of which travels from *north-west* to *south-east*, the other from *south-west* to *north-east*?"

The fact of storms being sooner felt in the State of Florida than of Maine is easily reconciled with the views of Espy and Loomis, that storms accompanied with a depression of the barometer near the central line of the storm, are of great length from north to south, and move side foremost towards the east.

If observations are merely confined to the Atlantic coast, every winter storm must have an *apparent* progression from *south-west* to *north-east*. Thus, during the November storm, the southerly wind set in, and the barometer began to fall twenty-four hours earlier in Alabama than it did in North Carolina. The north-west wind with its low temperature reached Jacksonville in East Florida about thirty-six hours sooner than it did the north-eastern parts of the State of Maine. The cause of this is readily seen by looking back to the small charts of the weather from the 9th to 14th November. The phenomena, having a progression from *west* to *east*, reaches the Atlantic coast first in Southern Georgia, *not because it is the most southerly portion of the coast, but because it is the most westerly*. We have only to remember that the cold winds set in seventy-two hours sooner both at Fort Smith in Arkansas and at Fort Snelling in Minnesota than at Savannah in Georgia. If the line of the Atlantic coast had run from north-west to south-east, and if observations had been merely confined to the coast, storms would have had an *apparent* progression from *north-west* to *south-east*. Before visiting America, I was not aware of the fact that a long line of low barometer, west of the Mississippi, and stretching from the Gulf of Mexico to the Lakes, invariably preceded the winter storms of the coast. On the first opportunity I had of discussing this subject with Espy, I made the remark, "If the line of the Atlantic coast had run due south and north instead of south-west and north-east, in all probability the rotatory theory would never have been applied to the storms of extra-tropical Atlantic latitudes?" "No," replied he, "I do not think it ever would."

Dove, Reid, Milne Home,* and others, who have examined the storms of Europe, have committed an error corresponding to the one that has been committed in America. In their attempts to explain the veerings of the wind on the rotatory hypothesis, they have assumed that the phenomena have a progression from *south-west* to *north-east*, when the progression is only apparent from that quarter. The fluctua-

* I may mention that, in a communication to the author, Mr. Milne Home seems now disposed to abandon the rotatory theory of storms.

tions of the barometer in Europe, which have been laid down in curves by Daniell, in his "Essays on Meteorology," are quite sufficient, though they have been strangely overlooked, to establish the fact of the westerly precession (a little to the north of west according to Espy) of the storms of Europe. As an example of this error we may refer to our short analysis on the storm of the 6th and 7th February 1856, in the *Edinburgh Philosophical Journal* for October 1856.

*Cause of the Long Line of Low Barometer first observed
West of the Mississippi.*

The progression of the changes of the weather from *west* to *east* during the storm of November will be rendered apparent by comparing the fluctuations in the temperature of the air with those of the barometer from the 8th to the 14th. The barometer stood below the mean on the 9th from Fort Brown on the Rio Grande to Fort Snelling, a distance of about 1400 miles. Indeed, I have no doubt that the depression of the barometer was co-extensive with the south wind. It is a general law in the northern hemisphere that the barometer falls with southerly and rises with northerly winds.

Dalton's theory of the fluctuations of the barometer is the most simple that has ever been proposed, and for extra-tropical latitudes especially, is remarkably consistent. Dalton referred the variations in the height of the mercurial column to variations in the density (or temperature) of the air at the earth's surface. In other words, warm air being lighter than cold air, the warm south wind will depress the barometer because it weighs less, while the cold northerly winds, being heavy, will cause it to rise. In fact, *as the thermometer rises the barometer falls*, and *as the thermometer falls the barometer rises*. This simple law explains the greater number of fluctuations of the barometer in extra-tropical latitudes.

Professor Espy was the first who traced the line of minimum pressure, extending from south to north, west of the Mississippi. This depression of the barometer in the west,

he states, occurs in winter for some time previous to the depression of the barometer and storms on the Atlantic coast.* As I differ with Professor Espy in regard to the cause of this extended line of low barometer, I shall merely state my own views. On examining Espy's charts of American storms, I was at once struck with the fact that the long line of minimum pressure corresponds with the course which the hot and moist winds from the Gulf of Mexico must pursue over the American continent. Thus the line of minimum pressure on 9th November (see Plate 2) extended from Fort Brown on the Rio Grande to Fort Snelling, that is, over the whole country swept by the southerly winds. This was a fine illustration of the truth of Espy's generalization, and Dalton's theory of the rise and fall of the barometer being due to the changes of density of the air at the earth's surface.

I have already given my reasons for supposing that the south winds of the United States are merely the trade winds diverted northwards by the high grounds of Central America and Mexico. The trade winds are limited to the lower regions of the atmosphere, and the south winds of the United States are also confined to the lower strata. It is highly probable that the south winds of the United States do not usually extend much above 10,000 feet from the earth's surface. The diagrams on Plate 5 are constructed on the supposition that the south winds of the United States are 10,000 feet in depth.

The principle upon which these diagrams are constructed is very simple, and some remarkable truths are, by their means, graphically represented; so much so, that after the principle upon which they are constructed is understood, the beautiful harmony of causes and effects is seen at a glance, as well as the course which the disturbances pursue over the continent to the east of the Rocky Mountains.

On looking at the chart of the weather on the morning

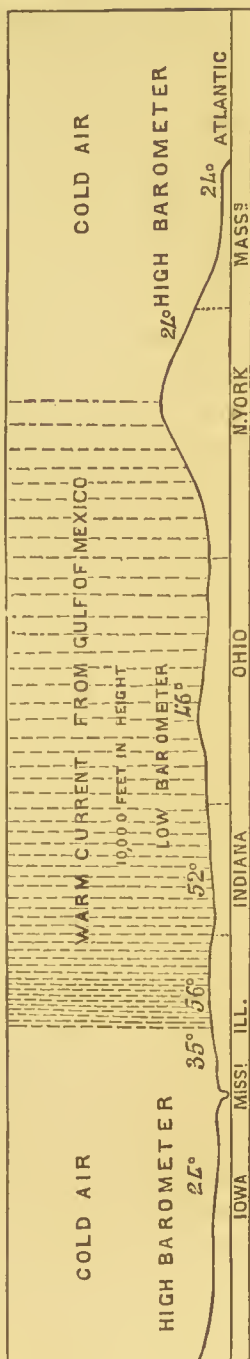
* 2d, Winter storms are accompanied with a depression of the barometer near the central line of the storm.

3d, This central line of minimum pressure is generally of great length from north to south, and moves side foremost towards the east.—*Espy's Second Report on Meteorology to the Secretary of the Navy.*

of the 10th November (Plate 2), we see that the warm and moist current from the Gulf of Mexico is banked on both sides by cold and dry air. The figure on this page represents a section of the atmosphere resting on the country from beyond the Mississippi to Massachusetts on the Atlantic coast, a distance of about 1000 miles.

If the relatively high temperature of the valley of the Ohio, as seen in the sketch, had extended to the top of the atmosphere, then the barometer must have stood much lower in Eastern Illinois than in Iowa or on the Atlantic coast in Massachusetts, because the temperature of the air was 32° higher. It is well known that air expands 1-480th part of its volume for every degree of increased temperature, consequently the air in Illinois was 32-480ths, or 1-15th lighter than in Iowa or on the Atlantic coast. The barometer should have been 1-15th of its whole height less where the air was warm, or, in other words, it should have shown a depression of two inches of mercury in the country swept by the southerly winds. Had the differences of temperature extended to the top of the atmosphere, the mercury of the barometer should have fallen 3-10ths of an inch for every five degrees of increased temperature. But the changes in the weight of the atmosphere do not by any means accord with these quantities, which indicates that the variations of the barometer are confined to the lower strata of the atmosphere, as Dalton argued.

But if the aerial Gulf Stream was 10,000 feet in height on the morning of the 10th November, the variations which the differences of tempera-



ture would occasion can be readily estimated. Under ordinary circumstances, a column of 10,000 feet of air at the surface of the earth will weigh nine inches of mercury. Accordingly, on the morning of the 10th, a column of 10,000 feet high of air would be 6-10ths of an inch of mercury heavier in Iowa and on the Atlantic States than in Illinois. Or, what is the same thing, the barometer should stand 6-10ths of an inch lower in Illinois than in Iowa. This difference is nearly equal to 1-10th inch of mercury for every 5° of heat. The fluctuations of the barometer from the 10th to 14th November correspond very accurately with the scale of 1-10th inch of mercury being equal to a variation of five degrees of temperature.

I have left out the day temperatures, and compared the fluctuations of the barometer at 7 A.M. and at 9 P.M. with the changes of temperature at these hours in most of the States of the Union. In order to exhibit more strikingly the relation of the temperature and the pressure of the air, the continuous lines in Plate 5 representing the pressure is inverted, so as to show their correspondence with the fluctuations of the thermometer, represented by the dotted lines. The figures on the right hand margin indicate the heights of the barometer in tenths of an inch; those on the left hand side of the thermometer, in degrees of Fahrenheit's scale.

By observing the fluctuations in the barometer and thermometer at the stations west of the Mississippi—at New Weid in Texas, Fort Smith, Fort Snelling—we find that they are almost simultaneous, though more than 1000 miles apart.

The changes in temperature and pressure are also simultaneous at Montreal and North Carolina, though upwards of nine degrees of latitude apart.

On the other hand, if the fluctuations at the stations on the Atlantic are examined, the westerly precession of these changes are no less conspicuous. But, as formerly stated, if observation had been confined to the Atlantic, the storm would have had an apparent progression from south-west to north-east, whereas the curves clearly show that it is nearly from *west to east*, in conformity with the views expressed by Professors Espy, Hare, and Loomis.

The correspondence between the fluctuations of temperature and pressure is less exact in the State of Maine, from the 11th to 14th, than in any other State which I have examined. This exception indicates that the stratum of warm air did not extend to so great a height in Maine. But the parallelism between the inverted curve of the barometer and the curve of temperature in Alabama is remarkable, and it forms as perfect an explanation of the fluctuations of the barometer as has ever been offered.

The rate at which the storm of November travelled over the United States can be approximately arrived at. The first traces of the cold westerly and northerly wind were observed in Iowa and Minnesota on the morning of the 10th November; but were not experienced at Boston, Massachusetts, in the same latitude, till the morning of the 14th. The distance between these two stations is rather more than 1000 miles, which exhibits an average rate of progression from west to east of about ten miles an hour. But a more minute examination would show that its progress was intermittent; for the surface wind from the west was almost at rest on the night of the 10th, and during the day time of the 11th, in Illinois and Indiana.

I think that it must be sufficiently evident that the storm and rains did begin to the west of the Mississippi on the 9th, and were gradually propagated towards the east; and in the words of Espy, the minimum barometer, extending in a long line from north to south, "moved, side foremost, towards the east." But the question arises, How is the storm, with all its attendant phenomena, propagated from west to east? I do not hesitate to confess that I have slightly changed my views on this important question.

The larger chart, Plate 6, exhibits the state of the weather at sunrise on the 10th November. The figures show the temperature in degrees of Fahrenheit's scale. The feathered arrows, the direction of the wind at the earth's surface; the naked arrows, the middle current in which the clouds are often borne along; the dotted arrows, the course of the upper current which prevails with so much regularity from a westerly quarter throughout the United States and Canada.

On the Atlantic coast the temperature, on the morning of 10th November, was low, as shown by the figures. This cold patch was about 800 miles in length by upwards of 100 in breadth. The winds there were somewhat irregular, as exhibited by the arrows, indicating the change that was approaching.

To the west of the Alleghanies, and as far as the Mississippi, southerly winds prevail, and each arrow head points to the high temperature which it has brought from the south. No doubt, the direction of the winds vary from S.E., and even E. to S.W. ; but this is no more than is to be expected in consequence of the irregularities of the surface, as well as of the local adjustments of disturbing agents, which will afterwards be discussed more particularly. We find three cases, for example, in Michigan, in which the arrows show that the clouds are moving from the S.W., while the wind is due south. But this action is equivalent to a translation of the air from S.S.W. It is worthy of observation, that the temperature gradually decreases in this south current of 700 miles in breadth as we approach the east coast on any of the parallels of latitude below the Lakes ; but the decrease of temperature is very abrupt as soon as the Mississippi is crossed to the westward.

It has already been seen that the southerly winds prevailed at all the western stations on the 9th, with their characteristic high temperature. But at sunrise of the 10th, the due west winds, and the north-west winds, have made their appearance, and just crossed the Mississippi, in the States of Wisconsin and Illinois ; while every arrow-head of the southerly winds points to its high temperature, every one of the north-westerly winds points to its low temperature. These north-westerly winds have begun to take possession of the territories of the United States in one broad current, and to clear the whole continent of the warm winds from the Gulf of Mexico.

To understand how this process takes place, and how the storms of the United States are propagated from west to east, we must become acquainted with the nature and origin of these cold westerly winds. The west winds form a most

peculiar feature, at all seasons, in the climatology of the United States and Canada.

Westerly Winds of North America.

Professor Espy says, in his Report—"It is known that the upper current of air in the United States moves constantly, from a known cause, towards the eastward—probably a little to the south of east." I was not acquainted with this fact before going to America; but during my tour through Canada and the Northern States, in the autumn of 1854, I was particularly struck with the upper current being invariably from the westward. The same phenomenon was observed during a residence of nearly two months in Washington. In the Southern States, also, the cirrus clouds were invariably from due west. My own observations on this point lead me to believe that the upper current is from a *point or two* to the *north of west* in Canada and the North-Western States, and *due west* at the latitude of Washington, as well as in all the States to the south. It is well to bear in mind, that the upper current in the Tropic of Cancer is also from a westerly quarter. While southerly and easterly winds, therefore, often prevail and blow with great violence at the earth's surface, the upper current is unchecked, and pursues its course to the eastward.

The cold winds which first begin to blow west of the Mississippi in all the extended rain and snow storms of the United States, are derived from the upper current which crosses the Rocky Mountains. In traversing these mountains the air is robbed of its moisture, and when it descends down their slopes, and pursues its course as a surface wind over the United States in winter, the cold becomes intense. A due west wind is thus the coldest throughout the United States. Dr. Dwight, in his travels in New England, describes the character of these winds so accurately, that I shall quote two short passages:—

"In 1787, the west winds began to blow about the 20th November, and continued, with only four short interruptions, until the 20th of the following March; somewhat more than 100 days. During the whole time the weather, for the

season, was very cold." Also :—" In 1780, the wind blew from the west more than six weeks without intermission, and during the whole of this time the weather was so cold that snow did not dissolve sufficiently to give drops from the southern eaves of houses."

Dr. Dwight very justly regards the cold westerly winds which form the concluding winds of the American winter storms, as the descent of the upper current that crosses the Rocky Mountains from the Pacific. Volney also considered that the suddenness of the cold north-west wind was, in many cases, a descent from the upper regions of the atmosphere.

In autumn, winter, and spring, the whole territories of the United States and the British Possessions in America are alternately subjected to this cold current from the west, and to the warm winds from the Gulf of Mexico, which circumstance renders the climate so liable to those sudden changes of temperature which have been remarked by every traveller from Europe. When in Washington, during winter, I found that a warm south wind was always dreaded by the inhabitants, as the cold west wind was certain to follow. Sometimes a due west wind, with an azure sky, and the thermometer at 12° and 16° , would blow with great violence for two days. The lowest temperatures during winter in New England frequently occur when the west wind is blowing with violence. In Canada and the Northern States, however, the cold winter winds are more commonly from a point or two to the north of west, in conformity with the direction of the upper current.

The probable origin of the cold west winds of the American continent has been so far indicated. Their character has also been briefly described. I shall therefore return to the weather of November 1854, to consider more fully the particular process by which these cold winds from the interior displace the warm and moist winds from the Gulf of Mexico.

Towards this end let us examine the process as it is going on in the vicinity of the Mississippi, in the territory of Minnesota, and in the States of Wisconsin, Iowa, Missouri, Illinois, Indiana, and Michigan, on the 10th November, as seen in Plate 7.

The first thing worthy of notice is the circumstance of

the cold west wind already sweeping over the territory of Minnesota as well as the States of Iowa and Missouri. It has just crossed the Mississippi in Wisconsin and Illinois, and greatly reduced the temperature in the western parts of these States from what it was the previous morning. Every arrow indicating a due west or a north-west wind, tells its own tale in the low temperature that it has brought. By looking at the small chart, the consistency of this relation is seen to be most remarkable.

The weather was very cold in the morning of the 10th November and throughout the day, as I travelled from Galena on the Mississippi to Chicago on Lake Michigan. But the Smithsonian observations show that the weather was still warm on the morning of the 10th in the eastern and central parts of Wisconsin and Illinois, and over the whole of Michigan and Indiana.

The progress of the cold from west to east is strikingly exhibited in the following facts. At Beloit, Wisconsin, the temperature fell from 53° at 7 A. M. to 34° at 2 P. M. At Milwaukee, on Lake Michigan, from 52° at 7 A. M. to 38° at 2 P. M. At Ottawa, in Central Illinois, from 56° at 7 A. M. to 36° at 2 P. M. But at Madison, Indiana, which is considerably to the eastward, the temperatures at 7 A. M., 2 P. M., and 9 P. M. were 52° , 55° , and 43° respectively, and at 36° at 7 A. M. of 11th. So, also, at Grand Rapids in Michigan, the temperature at the same hours were 53° , 52° , and 38° .

Thus the line which divided the warm from the cold winds, on the morning of the 10th November, must have coincided very closely with the meridian of 90° west. This line seems to have extended southwards to the northern shores of the Gulf of Mexico. It is curious to observe the phenomena connected with the cold and warm winds within a limited area, in which we see them displacing each other, while all is regularity until the change of wind takes place.

It is curious to observe, also, that the warm south-west winds which are blowing in the eastern parts of Wisconsin and Illinois, and in Michigan and Indiana, are cut off by the cold north-west winds which have crossed the Mississippi. This cutting off of the south-west winds does not interfere with their

action in the country over which they yet prevail towards the north-east. They blow on as if no change had occurred in the south-west. The same process is going on all to the southward; for, as is seen by the large chart of the weather of 10th November, northerly winds are prevailing at Fort Smith in Arkansas, and the temperature is 12° lower than at Ottawa in Illinois, where the temperature is still one degree higher than at New Weid in Texas, which is below the 30th parallel of latitude.

The southerly wind that appeared as an unbroken current in the morning of the 9th from Fort Brown to Fort Snelling, was in course of being displaced by the cold west wind, and a rapid reduction of temperature ensued. The displacement was going on nearly on the same meridian for 1200 miles at least. From the sudden fall of temperature that ensued as the wind at any station changes from the south-west to the west or north-west, as well as from the fact of this taking place in a long line on the same meridian, it is evident that this was not a veering or curving of the south-west wind. The directions of the winds on the charts are completely opposed to this view. Various hypotheses have been proposed to explain the changes that take place in the directions of the winds during the American storms, which I believe are all similar in their action to that which occurred from the 9th to 14th November 1854. If the small chart (Plate 7) is again examined, we see that the winds *at Milwaukee and Fort Snelling were blowing right towards each other; the one having a temperature of 52° , the other of 22° .* But by 2 P.M. the south-east wind disappeared at Milwaukee, and the north-west had taken its place, and lowered the thermometer to 38° . According to Professor Loomis, the south-east wind ascends in consequence of the north-west flowing under it, and a part of it is carried to the south-east and a part to the north-west. I agree with Loomis that the north-west flows under the south-east wind, but it is very evident that the whole of the south-east flows towards the east as it is raised into the upper current that prevails so constantly from the west or north-west. This readily explains the change of wind which so often takes place from south-east to north-west, and also the great reduc-

tion of temperature that follows. Volney was very near the truth when he said that the south-east winds are often *doubled back*.

Professor Espy supposes that the south-east winds rise over a limited area, and ascend in a vertical column to the top of the atmosphere, and that part of the north-west winds do so likewise. He ascribes the *easterly progression* of the cold winds to the easterly course of the upper current. In this latter opinion I entirely concur.

But the direction of the wind at Madison, Wisconsin, as well as in Michigan and Indiana, on the 10th November, when the winds were blowing right towards each other at Fort Snelling and Milwaukee, shows that there is no limited focal area over which the winds ascend in a body. A cold westerly upper current prevailed over the region swept by the southerly winds from the 9th to the 14th November. *It is most consistent with all the facts to suppose that a portion of the warm wind from the south is constantly rising into the upper current over the whole area in which it blows.* Part of the warm wind from the south may be said to be *rubbed off by the upper current*, which is supplied by moisture to form *those clouds that only drift in it in winter or in summer after the wind has blown for some time from the south.*

An attentive study of the directions of the winds from day to day, I think clearly shows that the warm and moist winds from the south, which were first seen west of the Mississippi, are nothing but the propagation of the diverted trade winds from the tropics. How these south winds are propagated will be afterwards considered. It is our object, in the meantime, to show how the cold west winds displace the warm south ones.

As already stated, the north-west winds do not appear to interfere with the action of the southerly winds until they subvert them altogether by raising them into the upper current. The wind at Madison and Beloit, in Wisconsin, would pass from *south-west* to *north-west*; at Grand Rapids, Battle Creek, and Ann Arbour, in Michigan, from *south* to *north-west*, for the wind was south at all these parts; at Madison, in Indiana, from *east* to *north-west* (see Plate 7).

The prevalence of a current from the south-west in these States on the morning of 10th November, is remarkable. The variations in the directions of the winds at the earth's surface may be referred to irregularities of the country, and to the influence of local rains, which draw the winds towards them. There is much less irregularity in the cold westerly winds than in the southerly, as they do not precipitate much moisture unless over the country where they raise the southerly winds into the upper current.

Had we only traced the changes of winds and temperatures on the 10th and 11th November, from St. Louis, in Missouri, to Ann Arbour, in Michigan, that is, from *south-west* to *north-east*, there might have been some grounds for believing that these changes were propagated from *south-west* to *north-east*. But more extended observations show that they were nearly from west to east. The south-westerly winds that prevailed along the greater portion of the Atlantic coast, on the morning of the 13th, were cut off on the Atlantic coast of Florida by the north-west winds* in precisely the same manner as the southerly winds of Michigan were by the north-westerly winds of Missouri, on the morning of the 10th November. Franklin, it has been seen, confined his observations to the Atlantic coast which runs from *south-west* to *north-east*; hence his error of supposing that the American storms followed the line of the coast. Franklin's observation, as already stated, is quite reconcilable with that of Espy, which has been corroborated by Loomis, that winter storms travel from west to east.

We find changes of temperature brought about in the States of Alabama, Georgia, and Florida, on the 12th November, in a manner similar to that which took place in Indiana and Wisconsin on the 10th (Plate 7). The north-west wind, in approaching the Atlantic coast, *flows underneath the warm southerly current from the Gulf of Mexico, and raises it into the upper current, which is constantly from the west*. Thus, the north-west wind had reached Tuscalooza, Alabama, and Warrington navy-yard, West Florida, on the morning of the 12th; but the country to the eastward was everywhere

* See Plate 3.

under the influence of warm southerly winds. At Tuscalooza, Alabama, the temperature fell to 38° at night, and to 32° next morning. At Warrington, the north-west wind had apparently just set in on the morning of the 12th, for the temperature was at 70° ; but it fell to 42° next morning. At Sparta, Georgia, the wind was still from the south-west, with the temperature at 57° , on the night of the 12th; but next morning it fell to 38° with the north-west wind.

While the north-west wind had reached Jacksonville, in the north-eastern part of Florida, and Savannah, Georgia, on the morning of the 13th, and reduced the temperature, the southerly winds were prevailing along the whole Atlantic coast north of Thornbury, North Carolina, and maintaining the high temperatures. The north-west wind did not reach Maine till the night of the 14th November.

But to conclude this part of the subject, we may repeat that the cold wind from the *Rocky Mountains flows underneath the warm winds from the Gulf of Mexico, and raises them into the upper current, in which they are carried towards the east.* All the warm winds from the Gulf of Mexico are thus subverted *in situ*, and raised or tossed into the upper current. The cold north-west winds, in displacing the warm southerly winds, cause those sudden falls in the temperature to which the territories lying north of the Gulf of Mexico are so subject in the colder months.

The raising of the moist winds from the Gulf of Mexico into the upper current causes a considerable deposition of moisture. The power which propels the cold west winds over the territory of the United States, is the existence of the warmer and lighter air to the eastward. The colder and heavier air rushes into the warmer and lighter for the same reason as the air resting upon the sea in summer flows towards the land, when the air over it is rendered lighter by the rays of the sun. In fact, the sea breeze and many of the atmospheric phenomena of the Central States are similar in their action. It is necessary, however, to view still more minutely the individual phenomenon before we can take a comprehensive survey of the whole.

Northers of the Gulf of Mexico.

Dr. Hare, of Philadelphia, erroneously supposes that the "northers" of the Gulf of Mexico are a modification of the *north-east winds* which often prevail on the Atlantic coast.* This opinion, however, is not well founded, as I shall afterwards show that the "*north-easters*" of the Atlantic coast seldom reach the Gulf, though they blow *towards* that estuary. But all the evidence seems clearly to point to the west winds that descend the slopes of the Rocky Mountains as the source from which the terrific northers are supplied with cold air to reduce the temperature along the Mexican coast from the Rio Grande to Vera Cruz. The "northers" only occur during the cold season, and I quite agree with Dr. Hare, that this is owing to the "greater propensity for the air over the land at that season to displace that of the adjoining seas." The cold westerly wind at Fort Snelling preceded the cold northerly wind at Fort Brown by about 48 hours in November 1854; but in Central Texas the chart shows that a slight breeze from the north, with a reduction of temperature, took place on the morning of the 10th (see Plate 6). The cold westerly winds were drawn into the Gulf where the temperature is higher and the barometer lower. The north wind rushes in below the warm south wind, which is raised into the upper west current, and drifted towards the east. This action is sufficient to account for the northers being "explosive," as Mr. Philips says, "like a thunder storm," and the cold coming so suddenly.

As the cold west winds progress over the Western States in winter, the northers are propagated over the Gulf of Mexico from west to east. It has been shown that the concluding westerly wind of the storm of 10th to 13th November travelled over the Northern States at the rate of 10 miles an hour, so the northers seemed to travel at the same rate along the northern coast of the Gulf of Mexico. But the winter storms often travel with great rapidity over the United States,

* Whether simultaneously with the existence of the northers on the western coast of the Gulf, there *is*, or *is not*, a north-easter blowing from the United States territory eastward of the Alleghany ridge, into the aerial estuary over the Gulf?—*Queries and Strictures on Espy's Report, by Dr. Hare.*

and the northers of the Gulf of Mexico then travel with equal rapidity.

The storm which I experienced in January 1855, in sailing from Charleston to Havannah, drew my attention to the connection between the "northers" of Cuba and the storms of the United States. Before I left Cuba, accounts arrived of a violent storm occurring at Philadelphia, at the same time that the "norther" blew at Key West. I afterwards ascertained that the change of wind took place at the same time in Georgia, and from 10 to 12 hours sooner at Key West than at Philadelphia. The facts clearly showed that the west winds were sweeping the whole territory of the United States as well as the northern half of the Gulf of Mexico. After further studying this subject, I think that the suggestion I threw out in my lectures before the Smithsonian Institution is entirely borne out; namely, that the "northers" are merely a modification of the cold west winds of winter, which sweep the United States, and form the concluding winds of the storms at that season.

The temperature and winds at a few stations over the United States, from the 19th to 23d January 1855, are given below, as well as those which I registered in my voyage from Charleston to Havannah. From these figures the nature of the connection between the storms of the United States and the "northers" of the Gulf of Mexico is not difficult to trace. The progress which the storm had made on the 22d January is pretty accurately represented by the state of the weather on the 13th November 1854, as seen in Plate 4. It will be observed that the north-west wind and the reduction of temperature is not registered in Connecticut until 9 P.M. of the 22d. The extraordinary changes of temperature to which the Southern States are subjected in winter are strikingly exhibited.

TEXAS.

January 1856.

19th			20th			21st			22d			23d		
7	2	9	7	2	9	7	2	9	7	2	9	7	2	9
A.M.	P.M.	P.M.	A.M.	P.M.	P.M.	A.M.	P.M.	P.M.	A.M.	P.M.	P.M.	A.M.	P.M.	P.M.
SE	SE	SE	...	SW	SW	N*	NW	NW	NW	S	S	NW	S	S
52°	72°	58°	44°	81°	60°	32°*	44°	32°	18°	56°	38°	33°	66°	48°

IOWA STATE.

January 1856.

19th			20th			21st			22d			23d		
7	2	9	7	2	9	7	2	9	7	2	9	7	2	9
A.M.	P.M.	P.M.	A.M.	P.M.	P.M.	A.M.	P.M.	P.M.	A.M.	P.M.	P.M.	A.M.	P.M.	P.M.
E	E	E	N*	N	N	E	E	N	N	W	W	N	W	...
40°	60°	33°	30°*	34°	32°	16°	8°	6°	6°	12°	8°	2°	18°	14°

MISSISSIPPI.

SW	SW	SW	SW	SW	S	W*	W	NW	NW	W	SW	SW	SW	SW
44	60	54	56	65	63	53*	33	26	16	31	30	31	40	32

OHIO.

...	W	W	...	...	NW*	N	W	W	W	W	W	...	W	...
22	32	30	28	46	34*	32	36	34	13	20	8	5	22	18

GEORGIA.

SE	SW	NE	SE	SW	S	SW	SW	W	NW*	NW	NW	NW	S	S
30	61	47	48	64	53	57	65	51	26*	37	30	28	41	38

GEORGIA.

FLORIDA COAST.

KEY WEST.

HAVANNAH.

...	...	S	S	...	S	SE	SE	SE	NW*	NW	N	N	N	N
35	0	58	69	70	0	75	0	75	63*	0	0	62	0	0

PHILADELPHIA.

NW	NW	NW	NW	SW	W	NE	NE	NE	SW	W*	W	W	NW	W
30	36	30	30	35	33	33	35	42	44	35*	27	22	26	26

CONNECTICUT.

NW	W	NW	NE	E	E	NW	W	W	S	SW	NW*	W	W	NW
33	31	29	27	33	32	30	29	34	49	39	28*	24	26	20

An examination of these figures indicate that a warm body of air was propagated across the territory of the United States from the 19th to the 23d of January, at the rate of more than 30 miles an hour. The change of wind occurred from 24 to 36 hours later at Key West than in Texas. The distance is fully 1000 miles. As already stated in a former chapter, a "norther" with a bright sky blew at Havannah on the morning of the 23d; but the wind was NE. in the afternoon, the usual direction of the trade winds at that season.

North-Easters.

In almost all the winter and autumnal storms of the United States, there is a development of north-east winds in some parts of the territory. These winds are not nearly so common in the Southern States as they are in the Northern.

During a residence of nearly two months in Washington, during the winter of 1854-5, I had no opportunity of examining the action of the north-easters in that latitude. But in travelling through Canada and the north-western parts of New York State, in the autumn of 1854, three north-east storms occurred which were similar in their character to the north-east storms of the British Islands.

The greater frequency of the north-easters in Canada and the New England States is, in all probability, owing to the physical features of the country, which must be kept in view in considering the minor phenomena connected with the great aerial currents. The north-easters of the United States are merely a local development of winds. They are, no doubt, sometimes propagated from south-west to north-east along the coast of the United States; but notwithstanding this, it appears to me pretty evident that the influences by which the air at the surface of the earth is put in motion from the north-east, travel, or rather are propagated, from west to east, as part of the storms of winter. The disturbing influences reach the southern part of the coast of the United States first, in the same way as the north-west winds in winter storms, not because these parts are further south, but because they are further west.

To illustrate the action of the north-easters in their most simple form, we shall now turn to the large map of the weather on the morning of 10th November, Plate VI. There are only three instances to be seen in which the arrows show that a north-east wind was blowing at the surface of the earth. These are at Chapel Hill, in North Carolina, at Mount Calm, in Virginia, and at Montreal, in Lower Canada.

It is worthy of particular attention that the north-east winds at Montreal, at Chapel Hill in North Carolina, and Mount Calm, in Virginia, were blowing from a cold quarter, and bringing the cold air which existed towards the north and east; and yet the temperature rose at both places. At Montreal, the temperature was 21° on the morning of the 10th, and at 44° on that of the 11th. At Chapel Hill the temperature was 44° on the morning of the 10th, but rose to

62° at 9 P.M., and a fall of rain set in at 4 P.M. The observer at Montreal has not put us in possession of the course of the currents in the cloud-bearing strata of the atmosphere, which must have brought the warmth, *as the cold was intense in the quarter from which the wind was blowing.* At Chapel Hill and Mount Calm, however, the *naked* arrows indicate that a current from the south-west overlaid the north-east wind. This middle current, which brought moisture and warmth from the Gulf of Mexico, raised the temperature, and at the same time caused the north-east winds to become rainy and stormy.

Had not a warm and moist current overlaid the north-east wind in Carolina, it could not have had its temperature raised to such an extent, and at the same time have become charged with moisture. This development of a north-east wind was merely a north-easter on a small scale.

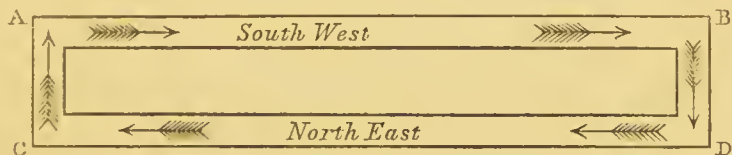
At the meeting of the British Association at Belfast, in 1852, I read a paper on the action of British north-east storms. Their action appears similar to that of those of the American continent. It is known that north-east winds, in Britain, are often very dry; but it is also known that those winds are sometimes attended by great falls of rain. The barometer almost invariably rises when these winds are dry and cold, and almost invariably falls when they are wet and stormy. A fall of the barometer usually precedes the north-easter in Britain. The depression of the mercury in this case is owing to the higher current being warmer, and consequently lighter. The barometer falls with the rise of temperature in the upper strata, as it would do if a south-west wind were to blow at the surface of the ground.

By looking at the map of the weather during the morning of the 10th November, Plate VI., it will be seen that the surface winds in North Carolina and in Northern Georgia were blowing right towards each other. Similar phenomena frequently occur in Britain; for south-west winds often blow in Devon and Cornwall while north-east winds prevail in the south of Scotland. There can be no such thing as two winds meeting at the surface of the earth; and therefore it

becomes a highly interesting question to understand the action which takes place between the winds that blow towards each other from opposite quarters, and yet never meet. It is easy to see that the facts cannot be explained on the rotatory hypothesis; for *winds could not blow right towards each other if they were revolving in a circle.*

With Professor Mitchell, North Carolina, I agree in thinking that the north-easters are similar in their action to that of the sea breezes of summer. The sea-breeze, for example, is often felt on the eastern coast of Scotland during the warm season; but it does not reach the west coast, on which a west wind often blows, at the same time as the east wind is felt on the opposite coast. The easterly sea-breeze rises into the upper current, and is again swept towards the east by the westerly wind that prevails above. The sea-breeze, therefore, may be regarded as a rotation between the lower and upper currents, in which the axis of rotation is horizontal.

I was not aware, before it was pointed out to me by Professor Henry at Washington, that Professor Mitchell, North Carolina, had explained the north-easters of the United States as being merely a rotation between the north-east wind below and the south-west wind above. Professor Mitchell's views are clearly stated in Silliman's Journal for 1831. Various objections have been made to his mode of explaining the action of the north-easters, and certainly the particular manner in which this action has been described by him is so far liable to certain objections.

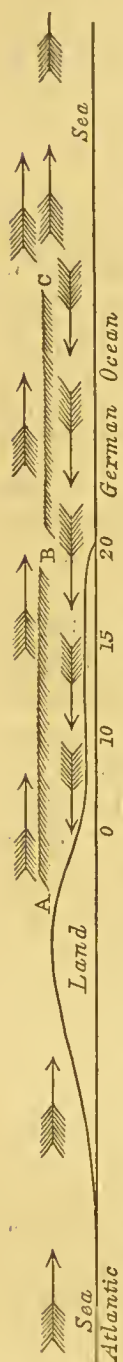


The arrows A B represent the south-west current, which overlies the north-east wind C D. The north-east wind is imagined to rise at one point, A C, and to descend at one point, B D. Dr. Halley attempted to explain the action of the trade winds on the same principle.

That the sea-breeze rises over the land, and is carried away in the upper current which flows in an opposite direction, all admit. And that the action of the north-easters are, in many cases, similar to that of the sea-breeze, I have every reason to believe. I entertain, however, views different from those of Professor Mitchell as to the manner in which the upper current descends and the lower ascends. I consider that it is highly important that the exact *modus operandi* should be understood, as the same principle of action applies to the north-easters, and a modification of it to the winds in other storms.

In the case of the sea-breeze, the wind that blows over the land does not rise in a column into the upper current at the particular spot where the breeze terminates; but as it *gradually* dies away as it reaches the interior, it clearly shows that it is as *gradually* absorbed into the upper current over the entire distance that it traverses. Thus, let the side figure represent the sea-breeze on the east coast of Scotland:—

The breeze as it touches the land is strongest—say twenty miles an hour; then it lessens to fifteen, then to ten, and, last of all, there exist a calm at a certain distance from the shore. The breeze never reaches this spot; for it is absorbed into the upper current betwixt A and B. The sun heats and expands the air as soon as it touches the land; and thus it rises until it is rubbed off by the current that prevails above. This principle of a gradual rising is the only one by which the gradual diminution of the sea-breeze, as it travels towards the interior, can be explained. In like manner, the air descends from above over the sea in the same gradual way. There is no focal area to which the wind rushes and rises in a body; for the focal area may be considered to extend as far as the breeze extends. It is quite clear that if the



whole depth of the breeze rose in a body into the upper current, the velocity or strength of the wind would be the same over the whole land that it swept until it reached the particular spot at which it ascended.

So far as my observation goes, the sea-breeze only occurs on the east coast of Scotland when the upper current prevails from the SW. This seems essential to the action of the sea-breeze on our coasts. The air over the land is heated during the day in summer to a greater degree than that over the sea. The one is rendered lighter than the other, and the colder and heavier air forces the lighter air resting upon the land to rise and flow away in an opposite direction. At the same elevation the barometer will stand lower on the land than over the sea. The *difference* in the weight of the two columns of air *is the propelling power of the sea-breeze*. Though the barometer stands lower on the land than on the sea, the air is constantly rushing towards the land, where it becomes heated and expands, and part of its column is swept off by the upper current.

Thus the sun, by heating the air to a greater degree over the land, maintains a lower barometer on the land than over the sea. This well-known fact of a lower barometer being constantly maintained over the spot to which the winds blow, like the trade winds blowing towards the belt of low barometer, only requires to be borne in mind to understand the important principle which comes into play in storms, during which the wind blows towards a low barometer, *and actually maintains the low barometer by the extrication of latent caloric when the vapour of water is condensed*.

The air that rushes towards the land in the sea-breeze rises into the upper current as fast as it flows towards the land. The rapidity with which it rises is regulated by the power of the rays of the sun ; as the heat increases the breeze increases, and *vice versa*. These simple principles are similar in their action to those which propel the winds in storms.

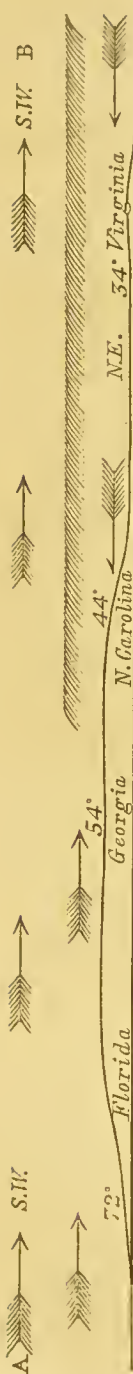
When treating of the theory of the trade winds, we showed that the air at equal elevations above the level of the sea flows from a higher towards a lower barometer. The sea-

breeze, it is universally admitted, is set in motion in obedience to the same law. Could we find, therefore, the cause of the barometer standing lower at one place than at another, and why it often remains low though the wind is blowing towards a certain area, we should be able to explain nearly all the phenomena of storms. We have seen that this same law holds in the case of the belt of low barometer at the equator and in the sea-breeze, and we shall now trace it in the north-easter of North America.

The north-easters of Britain and the United States are precisely similar in their action to the sea-breeze. At the surface of the ground, a lower barometer exists to the south-west, which is the cause of the air being put in motion towards that quarter. The cold north-east wind flows towards the warm south-west for the same reason that the cold air resting upon the sea flows towards the land heated by the rays of the sun. The large map of the weather of the morning of 10th November brings out this principle very clearly. The figure, however, exhibits the action of the north-easter in North Carolina.

The north-east wind does not rise at any particular spot in a body, but is gradually absorbed into the upper current A B, and is then carried towards the NE. The warm current that flowed from the SW. raised the temperature along the Atlantic coast on the 10th, for the air as a middle current was translated from Florida, where its temperature was 72° , towards Virginia, where the temperature was little above the freezing-point. Need we wonder, then, that the thermometer rose from 35° at Thornbury in North Carolina on the morning of the 10th, to 61° at 9 P.M., with a north-east wind.

The north-easters which are developed along the Atlantic sea-board are mere surface currents, which,



though blowing in the direction of the Gulf of Mexico, do not reach it, because they are gradually absorbed into the upper current, in the same way as the sea-breeze which flows into the interior. By the figure, we perceive that the great difference in the temperature between the Atlantic coast of North Carolina and the States of Georgia and Alabama would be quite sufficient of itself to cause the cold air at the surface of the ground on the north to flow southward.

The barometer stood about *two-tenths* of an inch *below the mean* for the month at Tuscaloosa in Alabama, while at the same time it stood about *two-tenths* of an inch *above the mean* at Thornbury in North Carolina. The air at the surface of the ground was thus, in accordance with the universal law which propels the winds, forced to flow towards the low barometer.

But while the air at the surface of the ground in north-east storms travels towards the south, the air at a certain height travels towards the north-east. Were the theory just indicated correct, the barometer should stand higher at the earth's surface in North Carolina, and lower at a certain height in the atmosphere where the current was SW. (or the reverse of the under), than at the same elevation in Northern Georgia. This was no doubt the case, and, as it will be shown, admits of complete demonstration from the well-known properties of air.

But before discussing the subject, I may again point out the place which the north-easters of America occupy in the widely extended aerial disturbances which begin to the west of the Mississippi, and are propagated to the Atlantic coast. The south-west current that overlies the north-east winds of the north-easters is a modification of the south wind which flows from the Gulf of Mexico. Both the surface north-east wind and the south-west middle current are overlaid by the upper current which flows so constantly from the west or north-west. In winter, the north-easters are invariably *succeeded* by a strong west or north-west wind. The change of wind from NE. to NW. is brought about in the same way as the change of wind was effected west of the Mississippi in Iowa (see Plates 2 and 7) from SW. to NW. in the morning of the 10th by

the lower and colder NW. wind flowing in below and raising the south wind into the upper current. The north-west wind enters below the north-east wind, and thus often causes the wind to change from NE. to NW.

As the southerly winds are propagated from west to east over the United States, they reach the Atlantic coast of the Southern State of Georgia sooner than the Northern State of Maine ; but the former is more to the westward than the latter. Hence the north-easters sometimes begin in the south, and are propagated along the Atlantic coast from SW. to NE. ; and like the NW. wind is also first felt on the Atlantic coast of Florida and Georgia, because that part of the sea-board is farthest west.

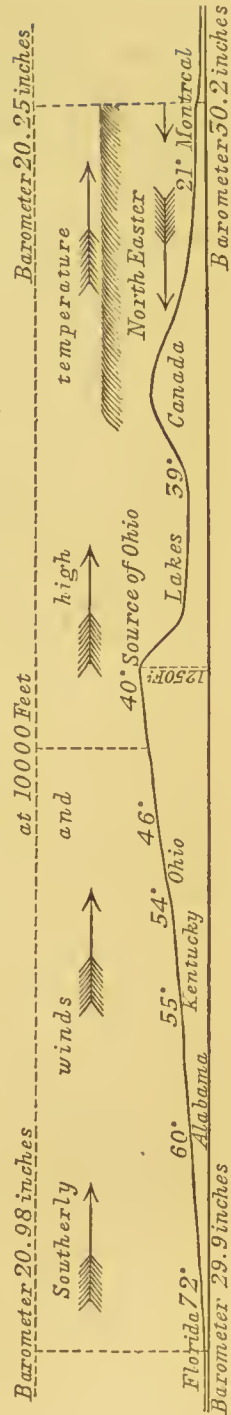
I have already said that north-east winds are much more common in the New England States and Lower Canada during the passage of storms from west to east than they are in the Southern States.* This circumstance I attribute to the peculiar physical features of the country. The physical features of any country must be considered in accounting for the minor and local courses of the winds on the approach of storms. The large map (Plate VI) of the weather of 10th November, as already mentioned, shows that the wind was north-east at Montreal, and blowing right towards the south-west winds which were prevailing in the Ohio valley. The direction in which the clouds were moving at Montreal is not given, but in the north-western part of the State of New York the clouds were coming from the south-west, as represented by the naked arrow in the chart (Plate VI). The rise of 23 degrees of temperature in twenty-four hours at Montreal could only be accounted for by the warmth and moisture brought from the south and west by the current which overlaid the NE. wind. The figure (p. 347) is an exaggerated section of the elevation of the country between the mouth of the Mississippi and Montreal. The distance is about 1400 miles in a straight line. The direction of the winds and the temperatures as at 7 A.M. of the 10th November

* This agrees with Espy's 18th Generalization. "In the northern parts of the United States, the wind generally in great storms sets in from the north of east, and terminates from the north of west."—*Report to the Navy*.

are given. The height of the barometer at Warrington Navy Yard, near the mouth of the Mississippi, was 29.98 inches, while at Montreal, 118 feet above the level of the sea, it was 30.11 inches; adding 1-10th of an inch for this higher elevation to reduce it to the sea level, the barometer would stand at 30.2 inches at Montreal, and 29.98 at Warrington as in the woodcut.

The source of the Ohio is only 1250 feet above the Gulf of Mexico, though about 1200 miles distant from it. The ascent of the country from the Gulf to the source of the Ohio is, therefore, little more than a foot to a mile. The wind was southerly over this vast slope on the morning of the 10th November, and raising its temperature. The thermometer, as already stated, rose 23 degrees at Montreal in 24 hours, in consequence of an upper current bringing a higher temperature from the south. This warmer and lighter air caused the barometer to fall a third of an inch in the same time at Montreal.

Notwithstanding that the barometer stood fully two-tenths of an inch lower on the shores of the Gulf of Mexico than at Montreal on the St. Lawrence, the surface winds are southerly along the Gulf and in the Ohio valley. But this circumstance is easily accounted for when it is recollected that the temperature of the air was 51° higher at the south station than at the north. The air was thus 51-480ths denser at Montreal than at West Florida. Therefore, at the height of 10,000 feet the barometer must have stood 7-10ths of an inch of mercury lower at Montreal than on the shores of the Gulf of Mexico; or, as shown



in the figure, the height of the barometer at 10,000 feet at the two places will be 20.25 inches and 20.98 inches respectively. The lower barometer at the higher elevation causes the middle current to flow towards the NE., while the higher barometer at the surface of the earth causes the air to rush over the land towards the south. This is only the same forces which are seen in the case of the sea-breeze.

The physical features of the country are favourable to the development of north-east winds in Lower Canada and the New England States during the passage of storms from west to east. The southerly winds from the Gulf of Mexico are drawn over a vast slope of 1200 miles, in consequence of the barometer in winter generally standing higher at a certain elevation in the Southern States than in the north, owing to the difference of temperature. This has the effect of causing the middle current to be southerly in Canada, while the lower is reactionary, or from the north-east. The same reasoning applies to the North Atlantic coast, where NE. winds are very common in winter during the passage of storms from west to east.

Though there had been no other forces in operation than those arising from the difference in temperature at the two places, West Florida and Montreal, on the 10th November, there would have been sufficient to have produced the winds that were prevailing betwixt them on that day. But there are other causes which give great local intensity to the action of north-east winds, and which will be afterwards considered.

Many of the north-easters of America are the effects of the lower winds rotating with the higher currents. The wind at the surface of the earth does not rise at any particular spot, but *gradually* rises, and is carried away by the higher current. Strictly speaking, there is no focal area, for the wind at the surface of the earth probably rises over the whole extent over which clouds form in the higher current.

Not only does this gradual ascent of the lower wind into the upper current take place in the case of "north-easters," in which the motion of the air above is diametrically opposite to that below, but the same mode of action takes place at all angles. On this principle, *nine-tenths* of the *south-east winds*

in Britain are overlaid by south-west currents, into which they ascend. I shall soon come to notice the gradual rise of the southerly winds from the Gulf of Mexico into the cold and dry current which constantly prevails from the *west* in the higher strata of the atmosphere over the United States.

There is always a development of north-east winds in some part of the Northern States in almost every winter storm. Dr. Hare puts the query:—"Whether there is not another distinct kind of storm known and recognized as the 'north-easter,' or 'north-eastern gale,' which has been distinguished from the 'south-easter,' so called by its direction, its longer endurance, lesser violence, and by its not being usually followed after a brief lull by a north-wester, nor any violent wind in a direction directly opposite to that in which it blew at the beginning of the storm?"

It is highly probable that there is little or no material difference in the action of the long continued north-easter and the ordinary storms of winter, further than that as the north-west or terminating wind of the American storms often travels much more slowly, or, in other words, is less violent during the warmer season, and thus the action between the NE. wind and middle current from the SW. *continues* longer. Thus, the NE. wind might have continued to rotate with the middle SW. current from the morning of the 10th November to the morning of the 13th along the Atlantic coast, as the NW. wind was only progressing from Fort Snelling, Minnesota, at the rate of 10 miles an hour, whereas the NE. could not have blown more than 30 hours in the January (1855) storm, when the cold current progressed from the Western States at the rate of considerably more than 30 miles an hour.

Indeed, I esteem it a most important fact to be kept in mind, that storms are propagated from *west* to *east* with much greater rapidity in winter than in summer. To this I would particularly call the attention of Espy, for I rather think it is sufficient to show that there ought to be no distinction drawn between the course which rains pursue in winter and in summer. The north-west wind is almost invariably the terminating wind in storms at all seasons in the Northern States, but it rarely blows with violence in summer over a great area of

country as it does in winter. This wind being warm and elastic in summer, cannot violently overturn, as it does in winter, the hot and moist winds from the Gulf of Mexico, when it is denser, and when the difference betwixt its temperature and that of the south winds is far greater. The great difference in the temperature of these two winds in winter is the chief propelling power of the winds in the American storms. At this point of the outline, we shall now glance at

The Thunder Storms and Tornadoes of the United States.

In summer, the *west* and *north-west* winds of the United States are distinguished by a sky of dazzling brightness. Not a speck of vapour is usually seen in the firmament; as Mrs. Stowe * with great poetic beauty writes:—"The sky of that firm clear blue, the atmosphere of that crystalline clearness which often gives to the American landscape such a sharply-defined outline, and to the human system such an intense consciousness of life." The atmosphere retains its purity until the south winds blow; when it first becomes more opaque, then clouds form in the upper current, and drift from *west* to *east*. For this reason the thunder storms and tornadoes of the United States, north of the 35th parallel of latitude, have a course from *west* to *east*; in the Northern States and Canada it is usually from the *north* of *west* to the *south* of *east*, as the upper current has this course in these latitudes.

In summer, the difference of the temperature of the south and of the west winds being much less, it is more difficult to trace the atmospheric changes; but, in fact, there is much less to trace, as the atmosphere over the United States is not disturbed in the same violent manner as in winter. No doubt, some of the disturbances, such as the tornadoes, are of a very violent character, but, like the "white squalls" at sea, they are very local.

The atmospheric phenomena of the summer, however, are deeply interesting to the meteorologist; and their study tends

* *Dred*, chap. xxiii.

to throw great light upon the conditions which impart the peculiar features to the winter storms.

In the Southern States, the temperature varies little in summer, as they are not subject to the eruptions of northerly winds at that season. The barometer is also remarkably steady. Professor Espy's charts show that the variation at Key West is then only that of the four daily fluctuations which take place with so much regularity within the tropics.*

In the Northern States, the temperature and barometer fluctuate much less in summer than in winter. We do not find any such contrasts prevailing over the United States as at 10th November 1854. But the fluctuations of temperature and pressure are still very considerable in the north even in summer. The facts bear out Dalton's views of the fluctuations of the barometer being caused by the fluctuations in the temperature or density of the air at the earth's surface. The following statement of results of observations for 1854, made at St. Martin; Isle Jesus, near Montreal, by Charles Smallwood, M.D., brings out the law very strikingly:—

	Mean Barometer.	Mean Temperature.	Range of Barometer.	Range of Thermometer.
January.....	29.516	10.92°	1.519	78.3°
February.....	.520	12.20	1.143	71.7
March.....	.024	25.84	1.076	60.4
April.....	.440	37.75	0.991	52.2
May.....	.731	57.17	0.708	60.7
June.....	.814	63.80	0.536	46.6
July.....	.916	76.20	0.565	48.5
August.....	.910	68.31	0.582	43.2
September.....	30.001	58.01	0.847	64.2
October.....	29.949	48.40	1.162	55.5
November.....	.764	32.99	1.542	50.6
December.....	.540	7.35	1.534	78.1

As the range of the thermometer increases, that of the

* Espy accounts for the daily fluctuations of the barometer as follows:—
 “When the sun rises, the air begins to expand by heat; this expansion of the air, especially of that near the surface of the earth, lifts the strata of air above, which produces a reaction, causing the barometer to rise; and the greatest rise of the barometer takes place when the increase of heat in the lower parts of the atmosphere is most rapid—that is about 9 or 10 A.M. The barometer from that time begins to fall; and at the moment of maximum heat, when the air is neither expanding nor contracting, the barometer indicates the exact weight

barometer also increases. The mean height of the barometer at Montreal during winter is also rather remarkable, for it is nearly half an inch less at that season than in summer.

The upper current from the west prevails with great constancy in summer. The south surface winds are also much more common at that season. In fact, the great fertility of the Mississippi valley, as already stated, is to be ascribed to the trade winds being diverted northwards over the United States and Canada. As in winter, the barometer falls with a southerly and rises with a westerly wind. In a communication, dated 14th July 1855, Professor Henry writes me :—" We have had a remarkable summer with the prevalence of NW. wind. The wind from the south sets in at intervals with a gradual diminution of barometric column, and an increase of moisture, a tottering equilibrium is produced. A *bouleversement* then takes place, and the whole breaks up with a thunder-storm. This state of things has existed a number of times during the last two months."

There are some curious facts connected with the meteorology of the summer months of the United States. According to the passage from Mr. Phelps' communication already given, the clouds that bring the rains on the Rio Grande are called " gulf clouds," and *float in the southerly wind*. I also learned from the planters in Louisiana, Mississippi, and Alabama, that the thunder clouds float in the south winds. This is quite the same as occurs in Britain; but the thunder clouds, as already indicated, in the latitude of Washington (38°), drift from *west* to *east* at the very same time that the southerly wind is blowing at the earth's surface. Mr. Peale, the

of the atmosphere. The barometer continues to descend on account of the diminishing tension of the air and consequent sinking upon itself as the evening advances, and its greatest depression is about 4 or 5 p.m. At this moment the barometer indicates a less pressure than the true weight of the atmosphere. The whole upper parts of the atmosphere have now acquired a momentum downwards, which, as the motion diminishes, causes the barometer to rise above the mean. This takes place at the moment when the diminution of the motion downwards is the most rapid. This maximum of rise, which takes place about 10 p.m., is small when compared with that at 9 or 10 a.m. As the barometer now stands above the mean, it must necessarily descend to a mean at the moment when the air is neither increasing nor diminishing in temperature, which is just before sunrise."—*Report to the Navy Department*.

naturalist at Washington, informed me that this phenomenon is so constant, and the course of the thunder-clouds is so nearly from *west to east*, that in going out there to walk, he never thought of taking an umbrella, if the thunder-clouds were a little to the *south* or to the *north* of due west ; but if the clouds were due west, he was sure to have rain. On the other hand, in the New England States and Canada, the thunder-clouds usually drift from a *point or two north of west* to a *point or two south of east*, at the same moment that the southerly wind blows at the earth's surface.

In the first thunder-storm that I encountered in the United States, I was rather struck with the phenomenon of the clouds drifting in the upper current from the west, while the wind blew from the south. It occurred at Saratoga on the 6th September 1854. At sunrise the temperature was 70° with a dew point of 69° ; the thermometer at 2 P.M. reached 96° . Notwithstanding the great heat, the wind blew strongly from south by west, but thunder-clouds floated in the upper current from the north of west. Thunder with much rain occurred at night, and next day the wind changed to the north of west, and the sky became beautifully transparent, with the thermometer at 82° at 2 P.M.

The cause of this peculiar action of the thunder-clouds floating at a higher elevation, at right angles to the warm southerly wind, is easily explained. So long as the wind is west or north-west in summer, the sky retains its transparency ; but when it changes to a southerly quarter, it does not blow more than a day or two before clouds begin to form. The clouds do not often float in the south wind, but almost always in that upper current which prevails so constantly from the west. This clearly shows that the upper current rubs off a portion of the moist and hot wind from the Gulf of Mexico, and forms clouds, for they only appear after the southerly wind blows for some time, and these clouds reveal the existence of the upper current. This action of the upper current robbing the lower is constantly taking place, both in summer and in winter, when clouds form and drift in the upper current.

As the heat and moisture increase in the south winds

below, the clouds increase above, and at last produce thunderstorms. Dr. Dwight, well known in this country from his theological writings, has given a most accurate description of these storms in his "Travels in New England." On one occasion, he says, "The meridional line upon which I stood was crossed by the storm several miles to the south. During the whole day the wind had blown from the south, and continued to blow in the same direction on the surface throughout the afternoon, without a moment's intermission. But had the wind," says he, "which carried the cloud when it passed over the meridian, swept the surface, the wind, for a time at least, must have been entirely stopped. This, however, was not the fact, even for a moment." On another occasion, 1809—"a thunder-storm passed over New Haven, from the north-west, with great rapidity. It continued, I judge, from an hour to an hour and a half. But though the clouds moved rapidly to the *south-east*, a *south-west wind* blew the whole of that day, and *while the thunder-storm was overhead, with great violence.*"

The increase in the strength of the south-west wind, as the clouds drift overhead from the north-west, shows that the lower and upper current influence each other on the passage of the clouds. The increased strength of the south-west wind does not extend beyond the cloud. This clearly indicates that part of the south-west wind ascends into the cloud, and that the air had so far descended on the borders of the cloud. The mode in which clouds, floating in the upper current, influence the air at the surface of the earth, must now be noticed. The mode also in which the winds are driven in thunder-storms is peculiar; though in more widely-extended storms, they are influenced by the same law.

Humboldt, in his celebrated voyage from Europe to South America, relates, "In reaching the latitudes of the trades, the wind fell gradually the farther we receded from the African coast: it was sometimes smooth water for several hours, and then short calms were regularly interrupted. Black, thick clouds, marked by strong outlines, rose in the east, and it seemed as if a squall would have forced us to haul our topsails; but the breeze freshened anew, there fell large drops of rain, and the storm dispersed. Meanwhile it was curious to

observe the effects of several black, isolated, and very low clouds which passed the zenith. We felt the force of the wind augment or diminish progressively, according as small bodies of vesicular vapour approached or receded. It is by the help of the squalls, which alternate with dead calms, that the passage from the Canary Islands to the Antilles, or southern coast of America, is made in the months of June and July."

In these squalls there was a calm both before and after the passage of the cloud. The motion of the air at the surface of the sea must have been much the same as if the whole air under the cloud were in a state of vertical rotation around a horizontal axis. There is a great resemblance between the motion of the air under the cloud and that in the sea breeze. Illustrations of the same principle are met with every day in showery weather, as it is well known that a gust of wind and a shower of rain or snow accompany each other. The sea-breeze is produced by the difference of temperature in the air over the sea, and of that over the land. In squalls the disturbance arises from the evolution of latent caloric, by the condensation of watery vapour expanding the air, and rendering it lighter.

As the squall or thunder-clouds drift over the surface, they tend to draw up the air. The formation of clouds, and consequent precipitation of moisture, are chiefly produced, as Espy has demonstrated, by the ascent of comparatively moist and warm air from below. Expansion from diminished pressure lowers the temperature, and the watery vapour is precipitated as clouds and rain. The condensation of vapour sets free a large amount of latent heat, which expands the air within the cloud, and thus produces an increased buoyancy. The temperature of the air within the cloud being higher than that on the outside, in consequence of the evolution of latent heat, the passage of a thunder-cloud over any place almost invariably disturbs the air at the earth's surface. The extrication of heat is a motive power which constantly causes the air to ascend in the front of the storm as the clouds drift along in the upper current.

Unless thunder-clouds were constantly replenished by vapour being condensed by the rise of air from below, it is

physically impossible that they could continue to throw down such large quantities of rain over extensive tracts of country, as they are sometimes known to do. At no time, even within the tropics, is the air over one spot capable of precipitating more than three inches of rain.

I find, from personal intercourse, that Espy, Gibbes, and Redfield all admit that the air beneath thunder-clouds has a motion somewhat resembling a vertical rotation, with a horizontal axis. And I think the gradation is easy towards applying a modification of the same principle to the action of the eastern storms. *It also must be regarded as a moving power in the case of the south winds of the United States, both in summer and winter, at every spot over which clouds are forming in the upper current.* That it is so in thunder-storms, when the upper and lower currents are at right angles to each other, Dr. Dwight's observations incontestably prove.

The tornadoes of the United States seem to be a more intense development of the same forces that produce the thunder-storms. These terrific disturbances have long occupied the attention of naturalists. They are usually confined within a very limited area; but their violence is such that they uproot all the trees in the paths they pursue through the American forests. Their breadth is not more than a few hundred yards, and the air, except in that narrow track, is little disturbed. In the Southern States, along the shore of the Gulf of Mexico, the tornadoes have usually a course from south-west to north-east; and in the Northern, from north-west to south-east (Hare). These courses are the same as the thunder-storms pursue in the same latitudes.

The tornadoes have been ably investigated by Hare, Espy, Redfield, Henry, and Bache. Mr. Redfield considers that the observations indicate a *spiral*, but, at same time, *inward motion* of the air. The others that the motion is chiefly directly in-blowing. But the rise of air in the centre is admitted by all. The condensation of moisture as the air rises, and becomes cooled by diminished pressure, is held by Espy to be sufficient to account for all the phenomena. The violence of wind, as the tornado cloud passes over any spot, is merely the intensified action of the agents that all

parties admit come into play in thunder-storms, and which have been so accurately described by Dr. Dwight.* The ascending currents in these storms are sufficiently demonstrated by the large quantities of rain which fall over the tracks which they pursue. Branches of trees have also been sometimes carried up to great heights in the atmosphere, and have descended to the ground covered with ice.

Hurricanes of the West India Islands.

A few weeks' study of the meteorology of the American continent will satisfy one of the great area over which atmospheric disturbances are propagated at all seasons. Thunder-storms and tornadoes are merely local manifestations of general disturbances of the equilibrium. The accounts given in the newspapers of the violent thunder-storms which occurred in the beginning of September 1854, in the United States, drew my attention, in the first place, to the great area over which they were manifested; and, in the second, to the connection between the thunder-storms of the Northern States and the hurricanes of the West India Islands. In one of the lectures which I gave at Washington, I called the attention of the American men of science to this subject in the following terms:—

“During the first days of September (1854) the wind was generally from the south; the weather became excessively hot and oppressive; and the newspapers in all parts of the country were recording the high temperatures, when, on the 6th, thunder-storms took place nearly simultaneously in Iowa, Illinois, Indiana, Ohio, Pennsylvania, New York, New Eng-

* The same atmospheric conditions seemed to exist before the occurrence of the tornado which desolated part of the city of New Brunswick in New Jersey, in June 1835, as those described by Dr. Dwight as prevailing during thunder-storms in New England. Professor Johnston, in his paper read before the Academy of Natural Sciences, says, “The air of the morning, and indeed the whole of the day, up to the time of the tornado, was unusually sultry. At four o'clock the sun was still unobscured at Princetown; but within half an hour, a cloud from the north-west had reached that place, and a shower of rain, accompanied by a brisk wind from the south-west, had commenced. The evening continued tranquil until ten o'clock, when another shower of rain fell, accompanied with some wind.”

land States, and Canada. Large quantities of rain fell in various parts of the country. The storms were in several places somewhat locally developed. At some places the north-west upper current reached the surface of the earth for a time, but the south-west again blew as before, until a general change of the wind to the north-west took place, and caused a great fall of temperature. At Saratoga the thermometer stood at 96° in the shade on the afternoon of the 6th, and at 46° on the morning of the 9th at Rochester. It is a fact worthy of attention, that a severe storm, amounting to a hurricane, swept the north-eastern coast of the United States just about the time that this great change was taking place in the north and west. *It is certainly well worthy of the investigation of American meteorologists to ascertain whether any connection exists between the weather in the North-Western States and the hurricanes of the West India Islands, for in this instance the coincidence was remarkable."*

I was led to suspect that the hurricanes of the West India Islands were but the autumnal variety of the same disturbances which take place in the winter storms. Professor Espy was then inclined to draw a distinction betwixt the manner in which the autumnal and winter storms were propagated. I had occasion to express my doubts to him on this subject more than once, from the facts which I gathered concerning the hurricane that occurred at Charleston on the 8th September 1854.

On reaching Charleston, Professor Gibbes put into my hands a printed memoir, containing his investigations of the hurricane, which had deluged a large extent of rice-grounds* in that neighbourhood. He and Mr. W. C. Redfield, New York, had arrived at the conclusion that this was a rotatory storm, and that the course of its axis was along the coast from Florida to Newfoundland. But from my observations of the weather at that time, in the Northern States and Canada, I was led to infer that these autumnal West India hurricanes are like the winter storms *consequent on certain changes which take place in the north-western territories of the United States.* With all deference to Espy, for whose

* See Chapter X.

profound knowledge of the physics of meteorology I entertain the greatest respect, I still believe that the *modus operandi* of the two is similar. This opinion has been confirmed since I have had an opportunity of examining the valuable observations collected by Mr. Redfield on the celebrated Cuba hurricane of from 4th to 7th October 1844. I am much indebted to this gentleman for presenting me with the interesting results of his investigations of this widely-extended atmospheric disturbance, although I do not think that the facts, by any means, support his particular views. It appears to me, after further investigation and reflection, that the chief difference betwixt the winter and autumnal storms consists in the propagation of certain of the attendant phenomena, from *west to east*, being from three to four times more rapid in the winter than in the autumn storms. The development of certain of the phenomena is also more intense in the low latitudes.

Both Espy and Redfield have collected a vast number of observations relating to the particular phenomena of the Cuba hurricane of 1844. According to the observations which Mr. Redfield has furnished, a "norther" set in at Vera Cruz at 4 P.M. of the 2d October, and continued till the 6th. Now, it is well worthy of remark, that the "norther" did not set in at Western Yucatan until the 3d, *a fact which demonstrates that it was propagated from west to east in that low latitude.* The other observations which have been given by Mr. Redfield also indicate that the "norther" was propagated over the Gulf of Mexico from *west to east*, as in the winter storms.

In the Cuba hurricane, Mr. Redfield supposes that the centre of a vast whirlwind of 1000 miles in diameter, passed from the Honduras coast in a straight line over Cuba, and along the coast of the United States. But there are innumerable objections to such a supposition; and even the observations which he has furnished are entirely against it. The observations are easily reconciled with the views we have indicated in discussing the atmospheric changes from the 9th to 14th November 1854.

The *northerly winds* which were observed by Mr. Redfield, and which he imagines were the left-hand side of a vast

rotating gale, were merely a continuation of the cold winds prevailing at the same moment west of the Mississippi, from the shore of the Gulf of Mexico to Lake Superior. On the other hand, the southerly and easterly winds that prevailed in the eastern parts of the Gulf of Mexico were merely those constituting the trade drift current, which was diverted by the "norther" in the west of the Gulf, in the same manner as on the 12th November 1854. (See Plate 3.) We find similar contrasts existing during the time that the hurricane was raging in Cuba, betwixt the temperature of the air to the west of the Mississippi and on the Atlantic coast. The following temperatures at sunrise of the 4th October are taken from Mr. Redfield's collection of observations :—

WEST OF MISSISSIPPI.			ATLANTIC COAST.		
		Deg.			Deg.
Fort Snelling	.	34	Halifax, Nova Scotia	.	52
Fort Crawford	.	43	Hampden, Maine	.	54
Fort Smith	.	49	Boston, Massachusetts	.	59
Fort Towson	.	45	New York	.	60
Fort Jessup	.	52	Charleston, S. Carolina	.	67
			St. Augustine, Florida	.	70
			Key West	.	76

On looking at Professor Espy's chart of the weather for 4th October 1844, I was somewhat surprised to find a black line drawn through the Western forts, to show that the barometer stood high there at that time; and a red line on the north-eastern coast of the United States, to show that the barometer stood low there. As in the weather of November 1854, the cold air in the west caused the barometer to rise, and the warm air caused it to fall, below the mean.

The warm and moist weather which prevailed on the Atlantic coast on the 4th October 1844, was first felt west of the Mississippi, and was subsequently propagated from *west* to *east* over the continent, as in the weather from 9th to 14th November 1854. Thus, at the Western forts the temperature was comparatively high on the 2d October, and at the same time comparatively low on the Atlantic coast. At Fort Snelling, Minnesota, the temperature on that day was 48° at sunrise, and at Fort Brady, on the south-east end of Lake Superior, it was 50°; but it was no more than 21° at Hanover, New Hampshire, and 27° at Hampden in Maine. At the two last-

mentioned places, a rise of temperature and fall of barometer took place as the warm current from the south was established on the Eastern States.

But the observations which have been collected jointly by Espy and Redfield, further show that the low temperature with the high barometer first took place west of the Mississippi, in a long line from north to south, and travelled from *west* to *east*. Thus, at Fort Snelling, the temperature fell from 44° at sunrise of the 3d to 34° at sunrise of the 4th October; but at Fort Brady, on the Lakes, which is considerably farther east, the temperatures were 46° and 45° at sunrise on the 4th and 5th respectively. The temperature was exactly the same at Detroit, Michigan, on these days, and still stood at 46° at sunrise of the 6th, when it had fallen to 34° at Fort Brady. The temperature was 33° on the morning of 7th at Detroit, being later in falling, as the station is more easterly. At Toronto, Canada West, the thermometer indicated 44° on the 4th, 48° on the 5th, 48° on the 6th, and 33° on the 7th. Indeed, all these observations show that the cold weather travelled from *west* to *east*. Mr. Redfield has not given any observations of temperature beyond the 7th October, and therefore I am unable to trace the time at which the low temperatures occurred at Halifax, Nova Scotia. The curves of high barometer, as traced both by Espy and Redfield, establish the fact that a long line of high barometric pressure, extending from north to south, travelled from *west* to *east*, and kept pace with the low temperature.

It also shows the parallelism between certain of the phenomena of the winter storms and of the autumnal hurricanes, that the temperature in the Cuba hurricane of 1844 fell sooner at Charleston, South Carolina, than at Boston, Massachusetts. At the former, the temperature was 60° at sunrise of the 5th October, and only one degree lower at Boston, which is 800 miles to the north-east. In fact, Espy's chart* of the 5th October indicates that the north-west wind had cut off the south-west wind as far north as New York, while the south-west wind was then blowing in Maine and in Nova Scotia. The action seemed to be precisely similar to that

* Espy's Report to the Secretary of the Navy Department.

which took place on the 12th November 1854 in Florida, Alabama, and Georgia.

In the lectures I delivered at Washington, I threw out the hint, that as "striking changes in the temperature of the weather are produced in autumn by the colder wind from the west descending and bearing the moister stream before it; when this hot stream is extended along the Atlantic coast, *it* in all probability becomes the vehicle of the hurricanes which proceed from the West India Islands." On examining the phenomena of the Cuba hurricane of October 1844, I find they entirely bear out this view, inasmuch as the cold north-west wind, as has been stated, made its appearance at Fort Snelling, Minnesota, on the 4th, while the hurricane began to blow with fury at Key West in the afternoon, and a high range of temperature prevailed along the Atlantic coast.

Coincident with the low temperatures to the west of the Mississippi, a "norther," according to Redfield's observations, prevailed on the west coast of the Gulf of Mexico. This cold air from the continent displaced the warm air resting on the Gulf of Mexico, and produced the "norther" at Tampico and Vera Cruz. Vera Cruz is 2000 miles south of Fort Brady, Michigan, and the winds seemed to have been westerly or northerly over this immense area on the morning of the 4th October. Opposite conditions with respect to temperature and moisture extended from Key West Reef, south of Florida, to Halifax, in Nova Scotia, a distance of 1700 miles.

The parallelism, indeed, in the outlines of the general phenomena of the Cuba hurricane of October 1844, and the weather from the 9th to 14th November 1854, is apparently so close, that the alterations of a few figures in the small charts which I have given of the weather of 11th and 12th November (Plate 3), would represent with great truth the atmospheric conditions for the 4th, 5th, and 6th October 1844. The hurricane was developed in its greatest intensity when the cold westerly wind reached the Atlantic coast. This is a point that now requires consideration.

No doubt the intense action of the West India hurricanes has a progression from *south-east* to *north-west* over the

Lesser Antilles. The intense action of these disturbances is confined to a comparatively limited area. The thunder-clouds and storms, as well as the hurricanes, drift in this direction over the West India Islands. Their course in these low latitudes is owing to the abnormal nature of the tropical winds, as represented in Plate 1, and which was first pointed out by Volney. It will be remembered also that the thunder-storms and tornadoes of Texas, Louisiana, and Florida have a course from south to north, because the clouds float in the southerly wind, and propagate the disturbances in that direction. In the Middle and Northern States, on the other hand, the thunder and tornado clouds float in the westerly upper current, and hence they propagate the disturbances from *west* to *east*.

The hurricane clouds of 5th and 6th October 1844, drifted in the lower latitudes in the southerly current which prevailed off the Atlantic coast from Florida to Nova Scotia. But it must be observed that this warm and light current caused the barometer to attain its minimum depression along the Atlantic coast before the great depression occurred on the 5th at Key West, Florida Reefs. From Espy's reduction of the barometer, it appears that the pressure was below the mean in a straight line from Key West to the State of Maine. This line was evidently near the western edge of the warm current from the tropics. This current floating the hurricane clouds in the low latitudes of Cuba and the Florida coast, caused the intense action of the hurricane to have a course to the north-east after passing Key West, as is apparent in Plate 8, the charts of which are copied from Espy's report.

On the 6th October a stormy condition of the atmosphere extended from latitude 28° to 42° , and from the Florida coast to Bermuda. The great extension of the storm on that day evidently arose from local manifestations of the disturbed equilibrium arising from the diminished pressure caused by the current from the tropic. The storm was propagated to the *east* of Key West *as well as to the north-east*. The manner in which this propagation takes place in this and in the winter storms will be afterwards considered.

The terrific hurricane that occurred in Cuba and at

Key West on the 5th October must be regarded as a local development of disturbed equilibrium, which was consequent on a descent of the dry and cold upper current in the Western States, displacing the warm in the western parts of the Gulf of Mexico. The upper current is also westerly in the Gulf of Mexico, and the heating of this current by the ascent of air warmed by the extrication of latent caloric must tend to lower the barometer in the eastern parts of the Gulf and draw the air from the Caribbean Sea.

In regard to the interior phenomena of the West India hurricanes, I think that Espy's theory of their action is consistent with all the facts. Violent winds are often observed to blow right towards each other, as the winds sometimes do in north-east and other storms. It is evident that these contrary winds, like the south-east and north-east trade-winds in the belt of low barometer, must ascend over the space which intervenes betwixt them. As they ascend, the cold arising from expansion of the air from the pressure being diminished, causes a precipitation of moisture, and a consequent extrication of latent caloric. By this means the air is heated in the region of clouds, and ascending, stretches out above as fast as it rushes in below. The power of a hurricane is thus maintained and propagated from one part to another.

Professor Espy maintains that the whole force of the winds generated during hurricanes can be accounted for by the effects due to the extrication of latent caloric, while Professor Hare holds that part is due to electrical agency. In the case of the sea-breeze, a considerable body of air is put and kept in motion by slight differences in the weights of adjoining columns of air which are unequally heated. Were such differences in the atmospheric conditions to arise within a short distance of each other, as on the 10th November 1854 at the mouth of the Mississippi and at Montreal, tremendous disturbances would ensue. When the distance is great, the force is diffused in moving the whole body of air betwixt the stations. The expenditure of power in this diffused manner may be compared to the flow of the Mississippi over the last 1400 miles of its course, where the descent is less than three inches to the mile. On the other hand, when

the Niagara tumbles over its great precipice, it expends much power at once. The hurricane may be regarded as an aerial cataract, only the air is forced upwards. Since a slight fall of rain often produces such a remarkable disturbance as is noticed on the passage of the squall cloud, what must be the power evoked by the evolution of latent caloric in hurricanes? Six inches of rain have been known to fall during the passage of the hurricane clouds. The caloric set free by the condensation of this amount of water over every square mile is equal to that which would be generated in the burning of 2,620,000 tons of coal, allowing 1 lb. of coal to evaporate 13 lbs. of water. The clouds of the hurricane thus often interrupt the ominous calm as suddenly as the smooth flow of the stream is changed at the brink of the cascade.

The grand exception to Dalton's law, that the fluctuations of the barometer are occasioned by fluctuations in the temperature or density of the air *at the surface of the earth*, occurs in the West India and tropical hurricanes. In these atmospheric disturbances a depression of two inches of mercury is sometimes observed when the temperature at the earth's surface is not increased but rather lowered. Espy's theory, however, of this depression of the barometer being due to the heating and consequent expansion of the air in the higher beds of the atmosphere, as all must admit is the case in the belt of low barometer at the equator, affords a ready and simple explanation of it, and the only one that has been proposed, which is consistent with all the facts.

It would be inconsistent with this outline of the laws which regulate the atmospheric disturbances of North America to enter minutely into the interior phenomena of the Cuba hurricane of October 1844. It may be observed, however, that the arrows as laid down on the small charts of the weather for 5th and 6th October 1844 (see Plate 8) do not indicate that the winds were revolving round a centre where the barometer stood lowest, as has been contended by Mr. Redfield. He has supposed that the winds were revolving round a spot near A at 3 P.M. of the 6th October, but according to Espy, the hurricane was most severe at B, and the barometer stood lowest at C. In many instances, however,

the arrows indicate that the winds were blowing towards each other, and as at the belt of constant rains at the equator, still maintained a low barometer. The minimum barometer had not reached the 30th parallel of latitude on the afternoon of the 6th, nor does it appear to have progressed much farther in a northerly direction. The intense action of the hurricane was somewhat local, like the tornadoes of the summer months, which are only developed after the southerly winds have blown for some time and disturbed the general equilibrium. In like manner the general disturbance which took place on the Atlantic from Bermuda to the State of Maine seems to have so far restored the disturbed conditions, that the intense action observed along the Florida coast could not be propagated into higher latitudes. The formation and the drifting of the thunder and the hurricane clouds in low latitudes in the current from the tropics arise from the abnormal course of the tropical winds in the Caribbean Sea and Gulf of Mexico.

On looking at the small chart of the weather of 6th October 1844, in Plate 8, westerly and northerly winds are seen prevailing on the land at D; and, indeed, from Florida to Maine. These were the concluding dry winds, which, as in the winter storms, were reducing the temperature over the whole continent from *west* to *east*. This cold current sweeping the whole States, but with less violence than in winter, and causing the barometer to rise, reached the coast, while the warm current stretching from the tropics to Nova Scotia prevailed in the Atlantic. In this warm current was the hurricane developed as well as the high winds which blew on the Atlantic on the 6th as far as the 42d parallel of latitude. The area over which the stormy conditions existed, extended from north to south in a long and broad belt, in a manner exactly similar as they did on the 10th November 1854.

*Mode in which Storms are propagated from WEST to EAST
over the United States and Canada.*

In tracing the temperature of the air from the 9th to 14th November 1854, I left out the *day* temperatures. This was

done for the purpose of obtaining an estimate of the quantity of moisture in the air. The Smithsonian meteorological observations are made throughout the different States, at 7 A.M. 2 P.M., and 9 P.M.; those taken at the Military Forts, at sunrise, 7 A.M. and 9 P.M. Now, it ought to be kept in mind, that Dr. Anderson, St. Andrews, showed that the *temperature of the air at sunrise* is in general a close approximation to the *dew-point of the vapour of the air during the day*.^{*} The observations which Mr. Redfield has given connected with the Cuba hurricane of October 1844, show the close connection betwixt the dew-point and temperature of the air at sunrise, for at the Northern Forts the wet and the dry bulb thermometer often indicate the same degree of heat, showing that the air was at the time saturated with moisture. *Therefore it is the amount of moisture in the air* which determines the temperature of the nights. In showing the connection between the *rise of temperature* and *fall of the barometer*, and *vice versa*, I have left out the day temperatures altogether, and taken those at 7 A.M. and 9 P.M. The amount of moisture in the air being the chief element which regulates the morning and night temperatures, is actually the element which causes the rise and fall of the barometer, as seen in Plate 5. The hygrometer and thermometer have been too little studied when treating of atmospheric disturbances, as they often indicate the course in which the great body of the air is moving, however irregular the winds may be at the earth's surface. It may here be kept in mind, that the air is capable of containing double the quantity of moisture with every increase of 20 degrees of heat. On the 10th November 1854, for example, when the temperature of the air at sunrise (7 A.M.) was 51° in Indiana and Michigan, it contained 4.68 grains of water; while in some parts of New England, where the temperature was 11°, it could not contain more than 1.25 grains. There was little moisture in the air in Michigan and Indiana a few days before this date, for the temperature was low, and consequently we would have had little hesitation in inferring that the south wind must have been blowing, for it is well known that moisture does not increase with a north or a west wind, and it

* Edinburgh Philosophical Transactions, vol. xi. p. 161.

could not possibly have come from the Atlantic, for the air remained cold and dry on the coast.

In this case we are not left to conjecture, for all the arrows on the large map (Plate 6) show that the winds throughout the eastern portions of the Mississippi valley were southerly on the morning of the 10th November. This south wind being hot and moist, and consequently light, caused the mercury in the barometer to stand lower than on the Atlantic coast, where the air was dry, cold, and heavy. Thus there is an intimate relation subsisting betwixt the winds, temperature, moisture, and weight of the air. Let us keep this relation in mind.

Before storms and hurricanes occur on the Atlantic coast of the United States, the wind seems invariably to blow from the south over Texas and the country drained by the western tributaries of the Mississippi. (See Plate 2, representing the tropical trade drift for 9th November.) The south wind can only be supplied from the western part of the Gulf of Mexico, which again must be supplied from the Caribbean Sea. When the southerly wind blows immediately after the cold westerly and northerly winds have swept the territories of the United States, a great rise of temperature ensues; for the warm air from Yucatan and Vera Cruz will reach Texas in a day or two, and the air which rested on Texas will in the same time be carried as far north as Lake Superior, and the air to the north of the Lakes might be translated to the confines of the Arctic circle. The barometer will fall over the whole extent swept by the warm south winds. We need not speculate about the cause of the south winds blowing to the west of the Mississippi, as no hypothesis can be verified before observations are extended much further to the north. It is sufficient for our present purpose that observations prove the fact. The existence of this warm and light current affords a simple explanation of the long line of low barometer which was first traced by Espy as occurring west of the Mississippi before the winter storms on the Atlantic coast.

If the slight difference of temperature, and consequently of the weight of the air over the sea and over the land, is sufficient to create brisk winds on our coast during summer,

known as sea-breezes; and if the slightly lighter air existing at the equatorial belt of low barometer, calms and rains (see Plate I.), forms the moving power of the trade winds of both tropics, we should naturally expect, when the barometer falls about three-fourths of an inch of mercury lower in the Mississippi valley than on the Atlantic coast, as it did on the 9th November (and, according to Espy, in every winter storm),* that the air should flow from the high barometer on the coast to the low barometer in the Mississippi valley. Now, it is a remarkable fact, that as the line of low barometer, with its attendant storm, is propagated from the Mississippi to the Atlantic, the winds in the Eastern States begin to blow from an easterly direction.† Though the winds usually spring up from the east, they vary from south-east, east, and north-east, according to locality and other circumstances, of which we shall now give a short outline.

According to Mr. Phelps, it appears that the change in the direction of the wind on the passage of winter storms is more regular in Texas than in any other part of the continent. The south wind which causes the long line of low barometer west of the Mississippi, and supplies moisture for the snows and rains, is displaced by the cold winds from the north or north-west. Thus the change of wind is almost invariably from *south* to *north* in Texas.

In the eastern part of the Gulf of Mexico the wind during storms usually begins to blow from *east* or *south-east*, as in the November storm which we traced, and gradually veers round to *south* and *south-west*, with the temperature increasing and barometer falling. The wind then changes to *north-west*, when the temperature falls, and the barometer rises.‡

* It appears very extraordinary that Lieut. Maury, in his "Physical Geography of the Sea," has taken no notice of the discovery of Espy, a discovery which has been verified by Hare and Loomis, and which must form the starting point of all discussions on the climatology of North America.

† Espy's Second Report to the Secretary of the Navy.

‡ Professor Espy, in his second report, says:—"In the southern parts of the United States the wind generally sets in from the *south of east*, and *terminates from the south of west*." We so far agree with the first part of this generalization, though we have qualified it in drawing a distinction between the western and eastern parts of the Gulf of Mexico. The latter part of the generalization

This particular veering of the wind is easily accounted for. By turning back to Plate 2, it will be seen that the wind was south-east at Key West on the morning of the 9th November. The air was then flowing towards the line of low barometer, west of the Mississippi. Indeed, the wind at Key West only formed part of the vast aerial current which was raising the temperature, and lowering the barometer from the Gulf of Mexico to Lake Superior. It has been shown that a warm southerly current was propagated from *west to east* over the United States in November. In accordance with this fact, we find the wind at Key West gradually veering round from the *south-east* on the 9th, to *south* on the 11th and 12th (see Plate 3), when the hot and moist wind from the tropic was sweeping the coast of the United States. The wind changed to north or north-west at Key West, shortly after the cold west current cleared the State of Florida of the warm southerly winds (see Plate 4).

In the centre of the Gulf of Mexico the temperature and pressure of the air in winter vary comparatively little. The warm and moist south winds of the United States, being supplied from the trade or tropical winds, create great disturbances in winter. Thus, after they raise the temperature, and cause a diminished pressure to the west of the Mississippi, the air to the east of the Mississippi will be forced westwards, as south-east winds, in obedience to the law that air flows from a high towards a low barometer.

When the south-east wind blows from the Gulf of Mexico over the South-Eastern States, it becomes warmer, and *as soon as it becomes as warm as the south wind*, which at the same moment is to the westward, it will have no farther tendency to blow in that direction, and will naturally become a south wind. It is for this reason, that after the south-east wind blows for some time it veers round to the south or south-west, and becomes a part of the southerly current, which, by being lighter, in its turn draws the air on its eastern bank towards it from the south-east. Hence the manner in which

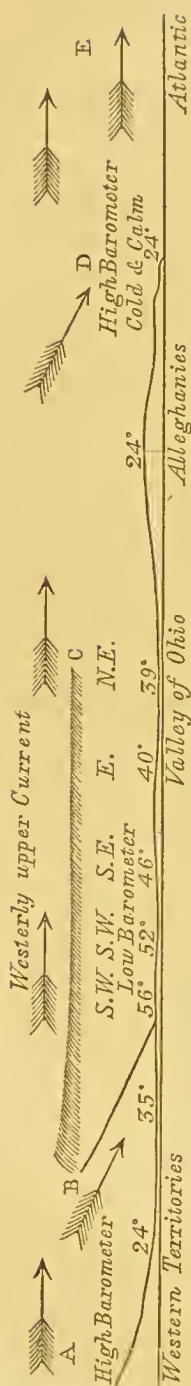
is evidently erroneous, for the terminating cold wind in the winter storms is more *northerly* along the shores of the Gulf of Mexico than in any other part of the United States.

the winds are propagated, and veer along the north-eastern shore of the Gulf of Mexico during storms.

The southerly wind does not blow long before manifesting that it contains within itself elements which increase its motion. Clouds form by the ascent of a portion of the air of the lower moist wind into the upper current, which prevails almost constantly from the west. The upper westerly current, therefore, is constantly rubbing off a part of the warm surface wind from the Gulf of Mexico. There are good grounds for believing that this process is carried on over the whole breadth and length of the southerly winds, and forms a powerful motive force, which is vastly increased as soon as rain or snow begins to fall. The more it snows and rains, the more is the air heated by the extrication of latent caloric, and the lower the barometer falls. The southerly winds blow with great fury in winter, as they rapidly lose their moisture, and have a portion of their upper surface continually swept off by the prevailing westerly upper current.

The southerly winds, it should be remembered, do not blow to a *focal area*, and rise in a body into the upper current, but, like the sea-breeze, rise gradually over the whole area in which they prevail. In fact, the gusty and irregular manner in which winds blow at the earth's surface shows that the cause of propulsion in part is locally developed. As Dr. Dwight has so well described the violence of the south winds of summer when thunder-clouds drift across them from the north-west, so when the sky is overcast, as it usually is after the south winds blow for some time, it is only a manifestation of the action which is going on in the region of the clouds, and propelling the winds below. By the condensation of the watery vapour of the south winds heating the air in the upper beds of the atmosphere, these winds carry the material—the elastic vapour—which creates a comparatively rarified space, into which they are violently forced, on the same principle that cold air rushes into a chimney where a fire has been lighted.

The veerings of the wind during storms are more irregular in Canada and the Northern States; but the mode in



which the southerly current, supplying the copious rains and snows that fall during winter, is propagated, is somewhat similar to that which takes place along the Gulf of Mexico. Indeed, west of the Alleghenies, the action appears to be quite similar. Owing to the circumstance, however, of the southerly current often being a middle one (which is again overlaid by the west upper current), the surface wind is often from the north-east, for reasons already given when illustrating Plate VI. The following figure, representing a section of the storm of 10th November 1854, in the Northern States, will exhibit more clearly the veering of the wind as storms progress from west to east:—

A B represents the cold wind which had just crossed the Mississippi on the morning of the 10th November. The cold air there causes the barometer to rise, because it is heavier. B C the space occupied by the southerly winds, at that time about 700 miles in breadth, which being warm, are light, and cause the barometer to stand low.

The cold and heavy air A B is forced towards the lighter and warmer air B C, for the same reason, that the colder and heavier air, resting on the sea, is forced towards the land in the sea breeze. The difference in the temperature and weight of the westerly and of the southerly winds, forms the propelling power of the westerly winds.

The gradual manner in which the temperature decreases from the western to the eastern edge of aerial Gulf Stream BC is remarkable. On the Atlantic coast the southerly winds have just set in, and the air is still cold and dry; whereas, in the eastern parts of Illinois, the temperature and moisture have attained

their maximum, in consequence of the southerly wind having blown there for some time. But in looking back to the chart and figures of the 12th, the southerly winds, it will be seen, have raised the temperature, and increased the quantity of moisture in the air, even to a greater extent on the Atlantic coast than they did in the same latitude in the valley of the Ohio on the 10th. The southerly current continued longer on the Atlantic coast; and thus, notwithstanding the immense quantity of rain which fell from the 11th to the 13th, the air became not only warmer but moister. This fact, viewed in connection with the progress of the cold air, is sufficient of itself to show *that the diverted trade wind from the Caribbean Sea was propagated from west to east across the continent.*

Immediately to the east of the southerly current, as at CD, the air is cold, dry, and nearly calm. The barometer also stands high. This was the case in the November storm; and, according to Professor Espy, it is a characteristic of the storms which visit the Atlantic coast in the cold season. At D, where the line of minimum temperature and high barometer exists, the air at the surface of the ground moves both towards the west and east.* I concur with Espy in holding that the air which supplies these outward winds is derived from the upper current.

On the approach of winter storms from the west, the wind in the Atlantic States often begins to blow from the north-east, as represented in the last figure. A south-west middle current overlies the north-easter as formerly described. The north-easters are partly owing to the physical peculiarities of the Atlantic coast, and partly to the existence of the cold air on the east causing the warm southerly current to flow above while the wind below becomes reactionary (see page 344). So long as the air below is relatively colder for its height than the middle current above, the north-easter continues; but as it becomes moistened and warmed by the current above from the south, it tends to veer round to east,

* "In the northern parts of the United States, the wind generally, in great storms, sets in from the north of east, and terminates from the north of west."—*Espy's Second Report.*

south-east, south, and south-west,* when it is raised into the upper current by the cold westerly wind flowing beneath it and causing the sudden changes of temperature.

In this way, then, is the warm and moist current from the Gulf of Mexico propagated from *west to east* (a little to *north of west to south of east* according to Espy) over the United States and Canada. That a broad southerly current of about 700 miles in breadth was maintained in the November storm, notwithstanding the variations of the wind at the earth's surface, is evident from the fact, that an immense quantity of rain was precipitated over the whole territory north of the Gulf of Mexico as the storm progressed from west to east. In the first place, the air in the Mississippi valley became warm and moist, while the air on the Atlantic coast remained cold and dry. And notwithstanding that the fall of rain as the storm travelled from west to east was copious, the moisture of the air, indicated by the temperature at sunrise, increased. This fact of itself is sufficient to demonstrate that there is a constant translation of comparatively warm and moist air from the south towards the north, because, on any other supposition, it is physically impossible that condensation of moisture could take place, and the air become still more charged with moisture. The increase of moisture as the November storm travelled eastwards was evident; and I believe this takes place in all the American storms, at least such is the case in all that I have examined. This fact so far bears out one which has been stated by Espy, that the storms of winter have often a slower rate of progression from west to east when they reach the Atlantic coast. The southerly winds continue longer, and thus not only furnish more moisture and rains, but cause greater fluctuations in the temperature and density of the air, and consequently of its weight. This explains one of Espy's generalizations, that "the fluctuations of the baro-

* Though I do not agree with some of the views of Professor Loomis regarding the storm of December 1836, in his interesting paper in the "Transactions of the American Philosophical Society for 1841," I am pleased to think that our explanation of the veerings of the wind just given is in entire accordance with his observations. He writes:—"At a certain distance from the line of minimum pressure, the courses of the winds are uniformly south-east. As this line is approached, the wind veers to the south, south-west, west, and north-west."

meter in winter are generally greater in the eastern than in the western parts of the United States." This also explains why less rain and snow fall in the north-western territories in winter, a circumstance to which the prairies, or treeless regions, probably owe their origin. But why southerly winds blow longer on the Atlantic coast than in the western territories is a phenomenon which I am not prepared to explain.

In the United States, then, the winds may all be regarded as modifications of the *south* and of the *west wind*. The modifications of the south are the north-east, east, south-east, and south-west, which, after blowing for some time, are characterised by a rising temperature and a falling barometer. The modifications of the west wind are the north-west and north, which are characterised by a low temperature and high barometer.

Indeed, the difference of temperature betwixt the cold Arctic current which flows down Baffin's Bay and along the Labrador coast, and the Gulf Stream as they meet off the coast of Newfoundland, is not nearly so great as the difference of temperature betwixt the west winds of the United States and the south from the Gulf of Mexico. It is somewhat curious that, while the aqueous current or Gulf Stream has been so ably investigated, the aerial current, which has produced so grand a result, has been comparatively overlooked; at least, the connection between the tropical winds of the Caribbean Sea, and the south winds of the United States, has received little attention since Volney wrote.

Recapitulation.

The calms of Cancer, with belt of high barometer and rainless regions, under the 30th latitude, do not exist in the proximity of the American continent.

The rainy and stormy character of the Gulf of Mexico and Southern States of America, is owing to the abnormal course of the tropical winds in those regions.

The southerly winds of the United States are more prevalent during summer, as the heated continent draws the air

from the Gulf of Mexico in the same manner as the sea-breeze or monsoon occurs during the hot season.

The winds of the West India Islands being often from the south-east, the thunder and hurricane clouds float in them, and the atmospheric disturbances have thus a progression from south-east to north-west. At the same time, however, it must be borne in mind that the hurricane clouds could not drift in such a current before it was established over the United States, and before the disturbed equilibrium took place as far as the south wind prevailed.

The thunder and tornado clouds drift in the south wind over the States bordering on the Gulf of Mexico, and thus propagate the disturbances from south to north.

On the other hand, in the Northern States and Canada, the thunder and tornado clouds drift in the westerly upper current which prevails constantly from the west in the Middle States and from the north of west in the Northern States and Canada. Hence the rains during thunder and tornadoes travel from west to east at the same time that the south wind, which supplies the moisture, is blowing at the surface of the earth.

In the United States, rains only occur in summer after the south winds have blown for some time and furnished moisture. The rains are thus chiefly derived from the Gulf of Mexico.

The winter rains are produced by the south wind first blowing over Texas and the country west of the Mississippi. The south wind occasions a great rise of temperature, and consequently a rarefaction of the air which causes the barometer to stand low in a long line from north to south.

The existence of the long line of low barometer west of the Mississippi causes the south wind to blow with greater strength the longer it blows, as the air flowing as an under current is always becoming warmer, and causing a greater fall of the barometer.

The temperature and pressure of the air vary comparatively little in the Caribbean Sea in winter; and as the barometer is constantly higher there than in the States swept

by the south wind, this is the power which propels the air from the high towards the low barometer.

The existence of the line of low barometer west of the Mississippi causes the air to the eastward to flow towards it as east winds, and the comparatively high pressure of the moist air in the Caribbean Sea gives rise to south-east winds in the lower latitudes of the United States.

From the fact of the south winds first blowing in a broad current west of the Mississippi in winter, and being rapidly propagated from west to east, the rains may be said with Espy "to travel from west to east," at the same time that the moisture supplying them comes from the south.

The southerly and easterly winds of the United States gradually rise into the upper current over the whole space throughout which they prevail.

The winter storms are virtually a rapid propagation of the southerly winds from the tropics over the eastern continent of America.

The west and north-west winds of the United States being derived from the dry upper current, the sky is of dazzling brightness so long as they prevail.

In summer, the north-west wind seldom blows with violence, because, being then warm and light, it does not rush into the southerly wind with much force, for the difference of their temperatures is small.

The difference of temperature between the two winds, the south and west, being less in summer than in winter, the fluctuations of the barometer are also less in summer.

In winter, the north-west winds of the United States clear the whole country of the warm south winds by flowing underneath them and raising them into the westerly upper current. In this way the cold weather and rising barometer are first observed in the north-western territories, and these phenomena are propagated from west to east.

In winter, the storms are often propagated from west to east at the rate of thirty-five miles an hour; while in the warmer season in autumn, the rate, as in the November storm of 1854, is sometimes not more than ten miles an hour.

It is also probable that the rate of progression is often less

when storms reach the Atlantic coast, a circumstance which causes the southerly winds to blow longer, to produce more rain or snow, and to cause greater fluctuations of temperature and of weight of the atmosphere.

The atmospheric disturbances are sooner observed in Florida than in Maine, owing to the former being more to the westward.

The "northers" of the Gulf of Mexico only blow during the cold season when the westerly winds sweep the United States.

The "northers" are merely the west winds drawn into the Gulf by the comparatively warm south winds, which they displace by flowing beneath them, and raising them into the westerly upper current.

The "northers," like the cold winds of the United States, are propagated from west to east.

The "northers" gradually lose their force when the continent to the north becomes heated and draws the winds from the Gulf of Mexico.

The extraordinary lowering of the temperature which ensues when the north wind displaces the south wind in winter, in the Gulf of Mexico, is totally inconsistent with the supposition that the northerly and southerly winds form opposite sides of rotatory gales.

The northerly winds sometimes prevailing in the western parts of the Gulf of Mexico, and the southerly in the eastern, have some resemblance to the parallel currents of Dove, but there is no evidence of rotation.

The cold westerly winds in the Northern States have no resemblance to the parallel currents of Dove, as they blow at right angles to the south wind, and corresponding changes of phenomena take place at the same moment on the same meridians at stations more than 1000 miles apart.

The winter storms on the Atlantic coast of the United States are preceded by a cold atmosphere and a high barometer; and as they are invariably preceded by the south winds flowing west of the Mississippi, they may now be anticipated by electric telegraph.

As the cold air which displaces the warm south winds

that begin first to blow west of the Mississippi, move slower in autumn, the hurricanes of the West India Islands might be anticipated by telegraph, when the cold winds are observed in the west, for they appear to be developed under conditions similar to those of the winter storms.

The long line of low barometer, with its attendant atmospheric disturbances, is often, no doubt, propagated from west to east, during winter, across the Atlantic to Europe.

At the present moment we have no means of anticipating the approach of some of the winter storms of Britain, beyond twelve hours before they burst upon our coasts; but as soon as the telegraph is laid down across the Atlantic, it is probable that the sudden irruptions of our high winds in winter may be known for three days or more before they occur.

Such, then, is an outline of the more important features of the climate of North America. I have endeavoured to give my explanation of certain well-marked phenomena as concisely and as clearly as possible. These views further observation and reflection may lead me to modify; but whatever may be the change in this respect, I shall always retain a lively and constant impression of the kindness, the hospitality, and the liberality which I experienced, in the course of my researches, from the American men of science who have devoted attention to this branch of study.

The meteorological observations which enabled me to examine into the climate of North America were, through the politeness of Dr. Henry, obtained from the Registers of the Smithsonian Institution. A few were obtained from the registers kept at the military forts, and on the next page are given those relating to the weather from 9th to 14th November 1854.

METEOROLOGICAL REGISTERS.

Key West Barracks, Florida. Lat. 24° 32' N. Long. 81° 47' 30" W. Alt. of bar. above sea 10 ft.

1851	Barometer.		Therm. out-door.		Wind.		Clouds.		REMARKS.
	Sunrise.	9 P.M.	Sun-rise.	9 P.M.	Sunrise.	9 P.M.	Sunrise.	9 P.M.	
9	30.197	30.205	72	75	E 2	E 3	0	SE 2	Meteor from N W to S at 5 P.M.
10	30.189	30.185	74	77	ESE 2	SE 2	SE 1	SE 1	Lightning at S W at 5 P.M.
11	30.173	30.134	78	79	SE 2	SE 4	WSW 2	S 3	A light shower at 12½ P.M.
12	30.126	30.193	78	79	S 4	SE 1	WSW 3	0	Squally during the night.
13	30.205	30.221	77	71	NNE 5	NNE 6	NE 4	NE 4	Distant thunder and lightning after sunset, and during night
14	30.233	30.217	63	64	NNE 6	NNE 5	NE 3	0	Rain, began 6½ A.M., ended 7½ A.M. Quantity .25
									Meteor from S to N E at 9½ P.M.

Fort Brown, Texas. Lat. 26° 10' N. Long.

9	29.96	30.00	72	75	SE 1	S 1	S 1	SW 1	Rain, began 11½ A.M., ended 12 N. Quantity .27. — Heavy showers, accompanied by thunder and lightning.
10	30.04	30.03	73	79	SE 2	SE 2	SE 1	E 2	
11	29.90	29.93	73	78	W 1	W 1	W 1	0	
12	30.42	30.42	45	56	NW 3	W 1	NW 1	NW 1	
13	30.45	30.47	44	57	NW 1	SSE 1	NW 1	0	Clouds stationary on the horizon at sunrise and during day.
14	30.44	30.46	51	65	N 1	NE 1	N 0	NE 0	

Fort Smith, Arkansas. Lat. 35° 30' N. Long. 17° 30' W.

9	...	...	52	64	E 3	S 3	S 1	S 4	At sunset clearness of sky, 0. At 8 P.M. silent lightning N and W. At 10 P.M. clearness of sky. From 10 A.M. to 8 P.M. high winds from the S. Clouds moving all day from S.
10	...	...	44	45	N 5	SW 1	NW 6	...	
11	...	...	33	37	E 3	N 6	EE 2	NW 6	Rain, began 1 A.M., ended 1.30 A.M. Quantity .30. — At 1 A.M. storm of rain. Thunder and lightning and heavy wind from N, from 9 P.M. of 9th to sunrise of 10th. Therm. fell 21°. At 9 P.M. too dark to perceive course of clouds.
12	...	...	26	29	N 3	W 0	NW 5	Haze.	Rain, began 1.30 P.M., ended 5 P.M. Quantity .28. — First ice of season. Light fog on river at 3½ P.M. Course of clouds changed from SE to NW.
13	...	...	22	39	E 1	E 1	N 1	0	Ground frozen—ice. Heavy hoar frost.
14	...	...	31	50	E 0	E 0	NW 1	Haze.	Frost.—From sunrise of 13th to 3 P.M. of 14th therm. rose 45°.

Fort Brady, Michigan. Lat. 46° 39' N. Long. 84° 43' W. Alt. of bar. above De St. Marie River, 22 feet.

9	29.429	29.410	23	27	S 2	E 4	0	0	Rain began 9 A.M.
10	29.150	29.095	37	37	E 4	E 3	0	0	
11	29.008	29.197	31	27	S 3	W 4	0	0	Rain ended last night. Quantity 0.29.
12	29.335	29.496	16	27	S 3	NE 3	0	0	Rain began last night.
13	29.065	29.217	25	23	N 3	N 3	0	0	
14	29.169	28.831	25	35	S 1	S 0	0	0	

Fort Snelling, Minnesota Territory. Lat. 49° 53' N. Long. 93° 1' W. Alt. of bar. above River Mississippi, 94 feet.

9	28.868	28.820	42	58	SE 1	S 1	S 1	0	Rain, began 12½ A.M., ended 9 P.M. Quantity 0.35. — Thunder 11½ A.M. Very boisterous.
10	28.877	28.900	22	20	NW 4	W 4	N 2	0	
11	28.910	29.266	16	20	W 4	W 2	W 2	0	Rain, began 1 A.M., ended 8 A.M. Quantity 0.15. — Snow. Severe frost.
12	29.300	29.300	12	20	W 1	N 1	0	0	Snow. Ice running in St. Peter's River.
13	29.200	29.100	18	24	E 0	S 1	W 1	0	
14	28.940	29.050	24	38	S 0	W 0	E 1	W 1	

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PLATE I.

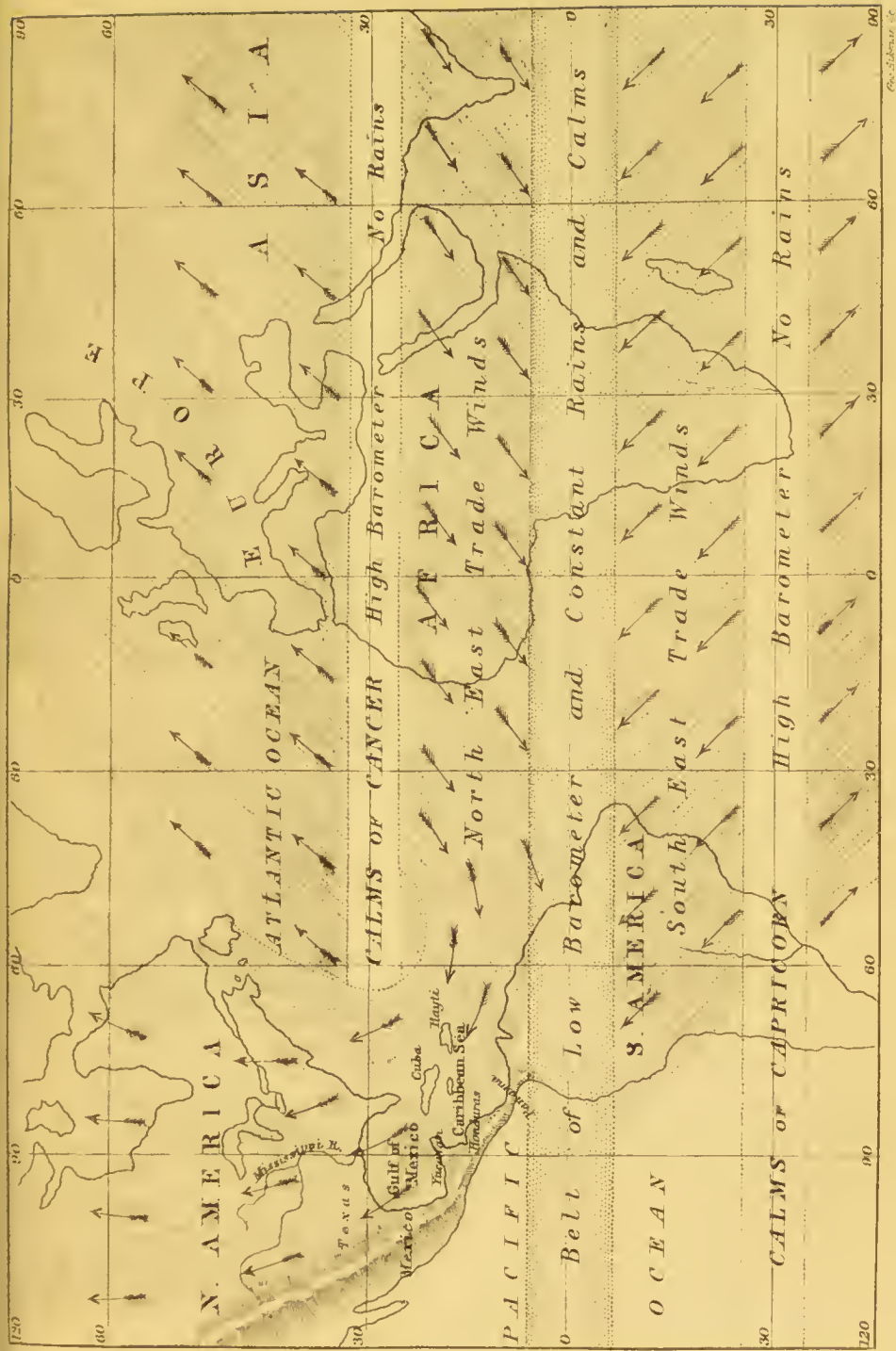
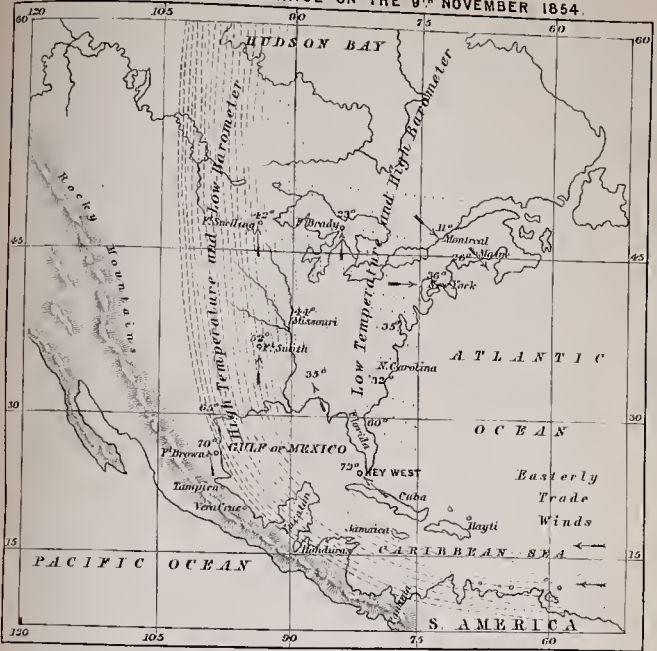


PLATE 2.
TEMPERATURES AT SUNRISE ON THE 9TH NOVEMBER 1854.



TEMPERATURES AND WINDS AT SUNRISE ON 10TH NOVEMBER 1854.

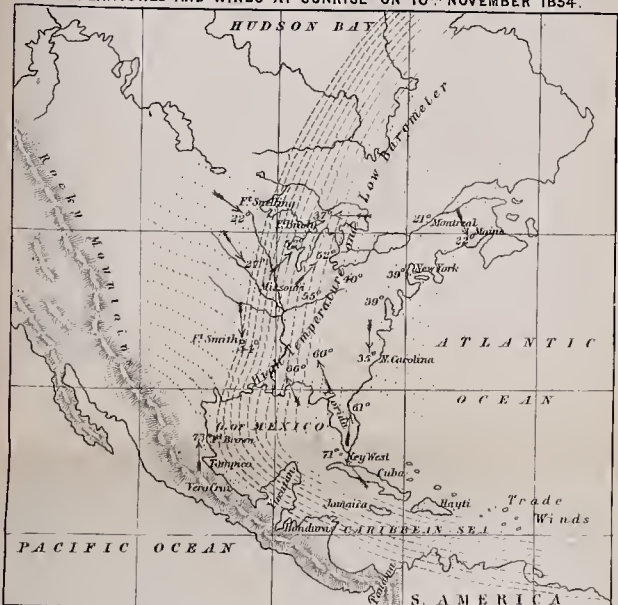


PLATE 3.
TEMPERATURES AT SUNRISE ON THE 11TH NOVEMBER 1854.



TEMPERATURES AT SUNRISE ON THE 12TH NOVEMBER 1854.

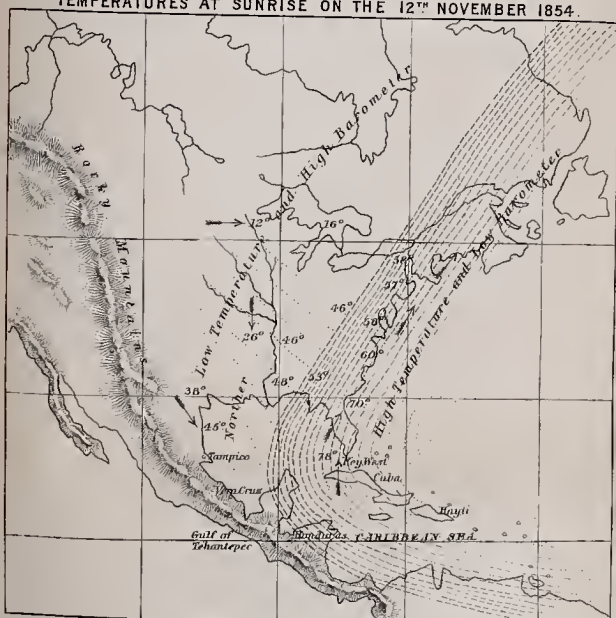
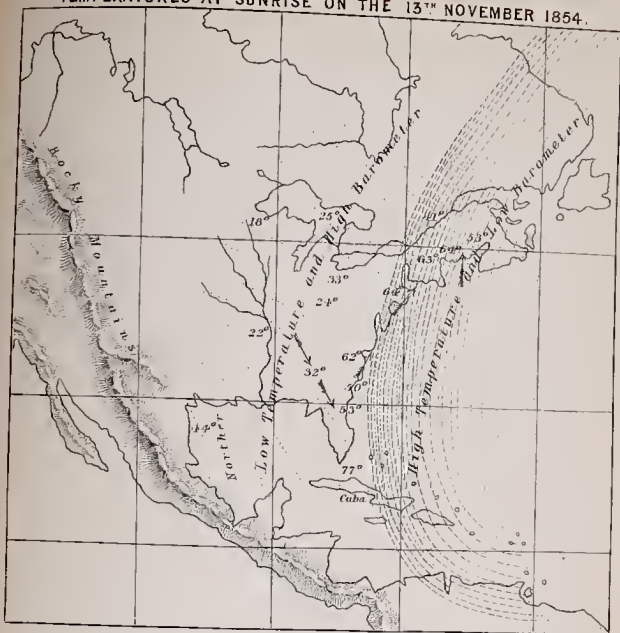


PLATE 4.
TEMPERATURES AT SUNRISE ON THE 13TH NOVEMBER 1854.



TEMPERATURES AT SUNRISE ON THE 14TH NOVEMBER 1854.

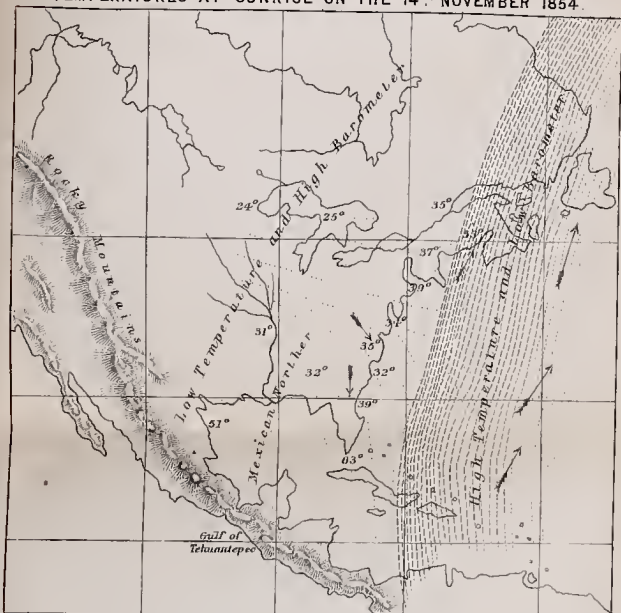
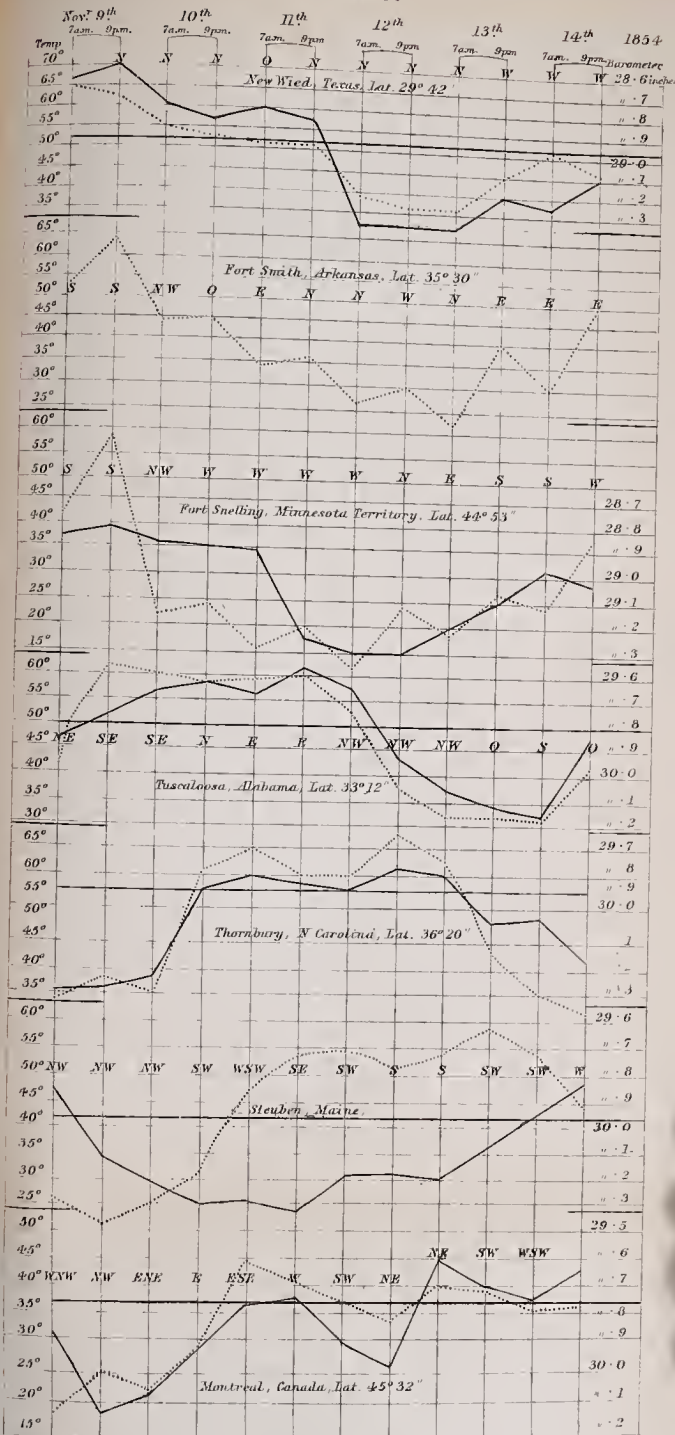


PLATE 5.





WEATHER AT SUNRISE ON THE 10TH NOVEMBER.

WEATHER AT SUNRISE ON THE 12TH NOVEMBER.

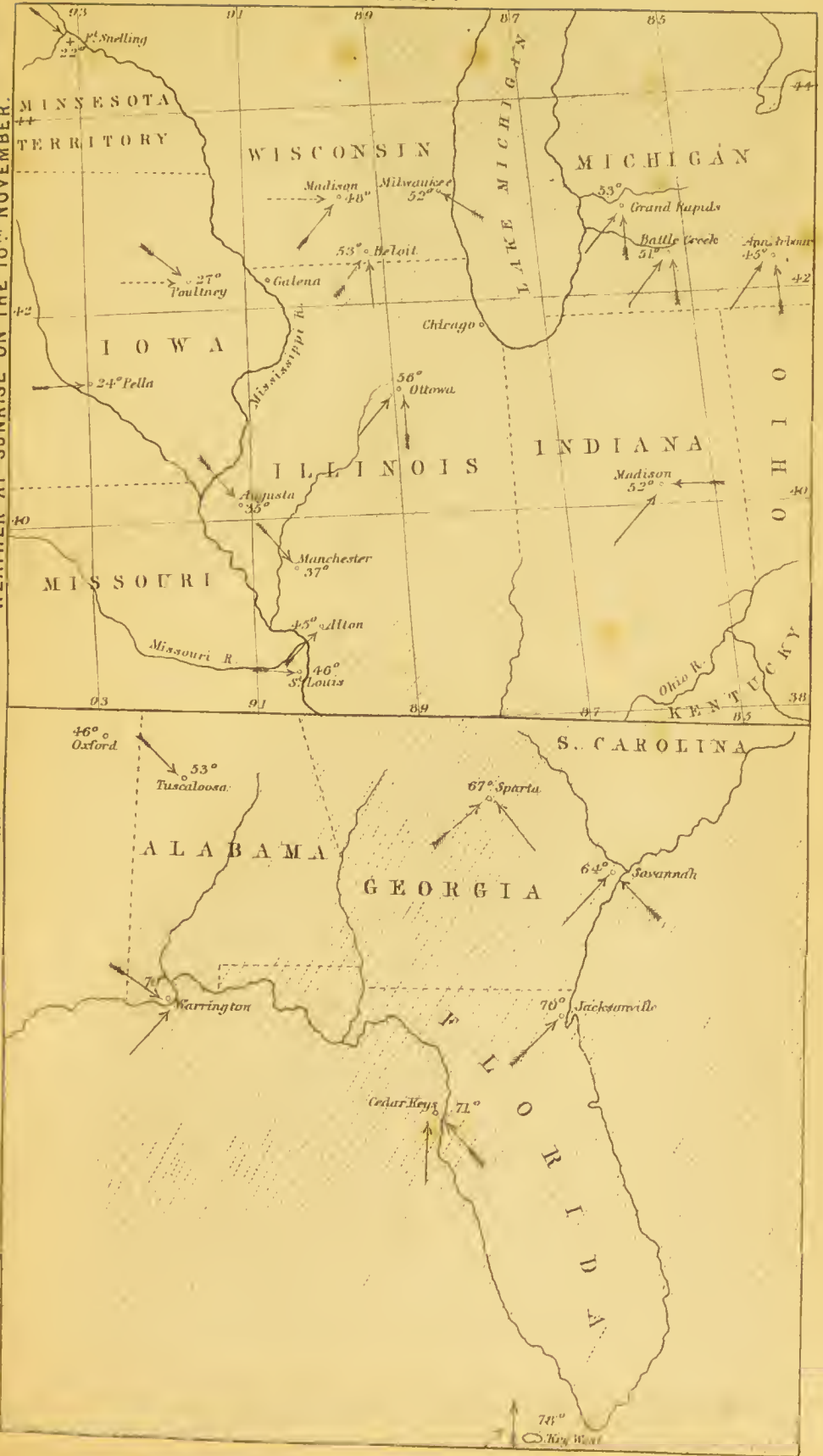




PLATE 8.
5TH OCTOBER 1844.

